Number 41 (November 2000)

11-1-2000

Number 41 (November 2000)

Southern Fishes Council

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Abstract
(November 2000) - Ichthyofauna and biogeography of Russell Fork (Big Sandy River - Ohio River). By Steven L. Powers and Patrick A. Ceas

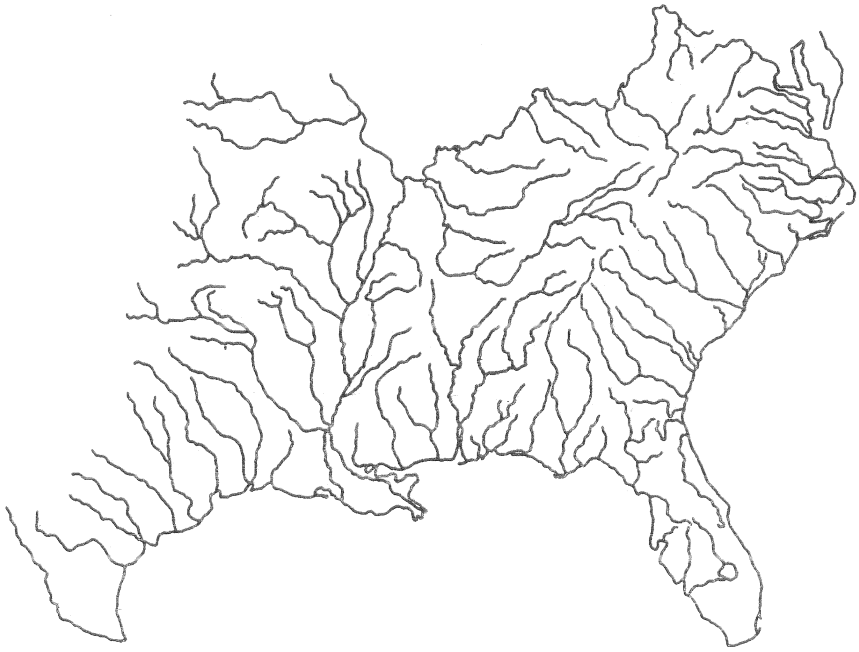
Minutes, Business Meeting, 25th Annual Meeting, Southeastern Fishes Council Regional Southeastern Fishes Council Reports

Keywords
ichthyofauna, russell fork, big sandy river

Number 41 November 2000

Southeastern Fishes Council Proceedings

DEDICATED TO THE CONSERVATION OF SOUTHEASTERN FISHES



Contents

27th Annual Meeting, Southeastern Fishes Council

The SFC will meet with the Association of Southeastern Biologist in New Orleans. The ASB meeting is 4-7 April. The ASB Call for Papers is available from the meeting website:

http://www.asb.appstate.edu/Announcements/CallForPapers2001.htm

Gibbs Award for Excellence in Systematic Ichthyology

Nominations are invited for the American Society of Ichthyologists and Herpetologists (ASIH) Robert H. Gibbs, Jr. Memorial Award for Excellence in Systematic Ichthyology.

The Prize is awarded for an outstanding body of published work in systematic ichthyology to a citizen of a Western Hemisphere nation who has not been a recipient of the award. The award is offered annually and consists of an appropriate plaque and a cash award (approximately $7500). The award recipient is announced at the annual meeting of the American Society of Ichthyologists and Herpetologists. The award for 2000 was presented to Dr. James C. Tyler, Senior Scientist, National Museum of Natural History, Smithsonian Institution, for his outstanding contributions on plectognath fishes, as well as his papers on several other groups of fishes, both recent and fossil.

Nominations may be made by any ichthyologist, including self-nominations, and should include the nominee's curriculum vitae, details of the nominee's specific contributions and their impacts on systematic ichthyology. Nominations should be submitted by 1 March 2001 in order for the nominee to be eligible for that year's award. Nominations will be effective for three award periods (2001-2003). Four copies of each nomination should be sent to Dr. Maureen A. Donnelly, Department of Biological Sciences, Florida International University, 3000 NE 151st St., North Miami, FL 33181-3000.

Ichthyofauna and Biogeography of Russell Fork (Big Sandy River - Ohio River)

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ABSTRACT

An ichthyofaunal survey of the Russell Fork of the Levisa Fork of the Big Sandy River in western Virginia and eastern Kentucky was conducted from May to November 1998. A total of 94 collections was made from 92 sites. A total of 65 species was collected. *Phoxinus oreas* was a new Big Sandy drainage record. *Ichthyomyzon unicuspis* and *Noturus flavus* were new Levisa Fork system records. *Clinostomus funduloides*, *Noturus stigmosus*, and *Stizostedion canadense* were Russell Fork system records. *Etheostoma nigrum* was a new record for the Virginia portion of the Russell Fork. Finally, *Lepomis auritus* was a new record for the Kentucky portion of the Russell Fork. Failure to collect *Ammocrypta pellucida* and *Nocomis micropogon* may indicate their extirpation from the Russell Fork system. Reports by previous investigators of *Ichthyomyzon bdellium*, *Nocomis biguttatus*, *Notropis atherinoides*, *Pimephales promelas*, *Carpiodes velifer*, *Ameiurus nebulosus*, and *Ameiurus melas* were determined to be erroneous. Deletion of these misidentifications, combined with the new records of this study, brought the total number of known fishes in the Russell Fork to 73 species. Fish data indicated that a series of cascades located near the Virginia-Kentucky border act as a barrier to upstream fish dispersal, causing a depauperate fish fauna in the upper portion of the Russell Fork. *Cyprinella galactura* and *Etheostoma simoterum* were hypothesized to be Russell Fork natives transferred via headwater stream capture with the Clinch River. Species of *Etheostoma* in tributaries to the upper Russell Fork exhibit allopatric distributions that are unexplained.

INTRODUCTION

The Russell Fork (Levisa Fork - Big Sandy River drainage) originates in Dickenson County, Virginia, and flows northwestward toward Kentucky. It is joined by the McClure River and the Pound River before entering the 300 m deep Breaks Canyon and dropping 100 m in its final three river kilometers (rkm) in Virginia (Dietrich, 1970). Within this 3 rkm, there are five cascades more than 3 m in height. Two of these cascades, approximately 3 m and 5 m high, are separated by less than 10 m of horizontal flow. The substrate in this area is exclusively boulder and bedrock (personal observation). After exiting Breaks Canyon, the Russell Fork gradient (1.9 m/km) becomes more typical of an Appalachian stream its size (Kirkwood, 1957). The Russell Fork flows 28 rkm in Kentucky before it empties into the Levisa Fork in Pike County, Kentucky, as a sixth order tributary. The system lies within the Central Appalachian Ecoregion and drains all of Dickenson County, Virginia, parts of Buchanan and Wise counties, Virginia, and Pike County, Kentucky (Kentucky Division of Water, 1997; Jenkins and Burkhead, 1993).

Although the first fish collections were made over 100 years ago (Woolman 1892), the Russell Fork system has been poorly sampled by ichthyologists (Robert E. Jenkins pers. comm.). The first known collections in the Russell Fork system were made in Kentucky (Woolman 1892). No additional collecting was done until 1937, when Clark (1941) visited the Kentucky portion of the Russell Fork, and Schultz and Reid visited the Virginia portion (Jenkins and Burkhead, 1993). Approximately five collections were taken from the Russell Fork system between 1938 and 1968 (Jenkins and Burkhead, 1993; Burr and Warren, 1986; Kirkwood, 1957; Turner, 1959, 1961).

More fish data from the Russell Fork system have become available since 1968, but many large tributaries have been poorly sampled or totally unsampled. Jenkins and Burkhead (1993) based their description of the Russell Fork fish fauna in Virginia on data from 41 collection sites spread over a 50-year period. Burr and Warren (1986) cited data from less than ten localities in Kentucky including Woolman (1892), Clark (1941), Kirkwood (1957), Turner (1959, 1961), Evenhuis (1973), Kentucky Nature Preserves Commission (1979), Robinson and Branson (1980), and unpublished records from the Eastern Kentucky University fish collection database.

Since Burr and Warren (1986) and Jenkins and Burkhead (1993), very little work has been done in the Russell Fork system. Kentucky State Nature Preserves Commission personnel made three collections in the Russell Fork system prior to this study. Bay (1986) sampled 14 sites in the Russell Fork mainstem, and Leftwich et al. (1994) sampled nine sites within four reaches of the Russell Fork mainstem. Because many of these more recent collections were made at previously-collected sites, and some collections had inexact locality information, the total number of historical fish collection sites (all sites sampled prior to this study) in the Russell Fork system was approximately 56 (Fig. 1).

A total of 73 fish species was reported from these 56 sites (Table 1). Sixty-seven of the 73 species reported from the Russell Fork system were reported from the Kentucky portion of the drainage. Only 44 species had been reported from the Virginia portion. Jenkins and Burkhead (1993) attributed the low species richness of the Virginia portion of the Russell Fork to degradation of the watershed by logging, mining, and development. However, Leftwich et al. (1994) suggested that a series of cascades located near the state line act as a barrier to upstream fish dispersal.

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Table 1. Species list for watersheds within the Russell Fork system[#]. 1 = lower Russell Fork mainstem and minor tributaries. 2 = Elkhorn Creek. 3 = Grassy Creek. 4 = upper Russell Fork and minor tributaries. 5 = Lick Creek. 6 = McClure River. 7 = Cranes Nest River. 8 = Pound River. G = generally distributed; O = occasional; S = sporadic [from Smith (1965)].

Family / Scientific name	Watershed 1	2	3	4	5	6	7	8
Petromyzontidae								
*Ichthyomyzon bdellium**								
I. unicuspis	S							
Lampetra appendix	S							
Lepisosteidae								
Lepisosteus osseus	O							
Anguillidae								
Anguilla rostrata	S							
Clupeidae								
Dorosoma cepedianum	O	S						
Salmonidae								
Oncorhynchus mykiss	S			S		S	S	S
Salmo trutta	S			S			S	S
Cyprinidae								
Campostoma anomalum	G	G	G	G	G	G	G	G
Clinostomus funduloides			S					
Cyprinella galactura	G	O		G	G	G	O	O
C. spiloptera	G							
C. whipplei	O							
Cyprinus carpio	O			S				
Ericymba buccata	O	O		O		S	S	S
Erimystax dissimilis	O							
Luxilus chrysocephalus	G	G		G	G	G	G	G
Macrhybopsis aestivalis	O							
Nocomis micropogon	S			S				S
*N. biguttatus**								
*Notropis atherinoides**								
N. ludibundus	O	O		O			S	
N. photogenis	G	O						
N. rubellus	G	O		G	O	G	O	O
N. volucellus	G	S						
Phenacobius mirabilis	S	S						
Phoxinus oreas			S					
Pimephales notatus	G	G		G	O	S	S	S
*P. promelas**								
Rhinichthys atratulus	G	G	G	G	O	G	G	G
R. cataractae	S							
Semotilus atromaculatus	G	G	G	G	G	G	G	G
Catostomidae								
Carpiodes cyprinus	O							
*C. velifer**								
Catostomus commersoni	O	G		O	O	S	O	O
Hypentelium nigricans	G	G		G	G	G	G	G
Ictiobus bubalus	S							
Moxostoma anisurum	O							
M. carinatum	O							
M. duquesnei	O							
M. erythrurum	O							
M. macrolepidotum	O							

Family / Scientific name	Watershed 1	2	3	4	5	6	7	8
Ictaluridae								
Ameiurus natalis	S	S		S			S	S
*A. melas**								
*A. nebulosus**								
Ictalurus punctatus	S	S		S				
Noturus eleutherus	S							
N. flavus				S				
N. stigmosus	S							
Pylodictis olivaris	S			S				
Atherinidae								
Labidesthes sicculus	S							
Cottidae								
Cottus bairdi					O	O	S	O
Moronidae								
Morone chrysops								S
Centrarchidae								
Ambloplites rupestris	O	O		G	G	G	S	O
Lepomis auritus	S	S		G	O	O	O	O
L. cyanellus		S		S		S		S
L. macrochirus	S			S			O	G
L. megalotis	S							
L. microlophus				S			S	
Micropterus dolomieu	G	O		G	O	O		S
M. punctulatus	S			S	S	S	S	S
M. salmoides	S	S		S			S	S
Pomoxis annularis	S			S				
P. nigromaculatus								S
Percidae								
Ammocrypta pellucida	S							
Etheostoma blennioides	G	O						
E. caeruleum	G	S		G	G	S		
E. flabellare	S			S	G			
E. nigrum	S	S					G	G
E. simoterum	S			S		G		
E. variatum	G	S						
E. zonale	G	S						
Percina caprodes	O	S						
P. copelandi	S							
P. evides	O							
P. maculata	S							
P. oxyrhyncha	S			O	S	S	S	O
P. sciera	O							
Stizostedion canadense	S							
S. vitreum	S							

[#] based on this study, Jenkins and Burkhead (1993), Leftwich et al.(1994), Bay (1986), Stephens and Prather (1985), Robinson and Branson (1980), Kentucky Nature Preserves Commission (1979), Evenhuis (1973), Turner (1959, 1961), Kirkwood (1957), Clark (1941), Woolman (1892) and collections housed at Eastern Kentucky University, and Kentucky State Nature Preserves Commission.

*erroneously reported, species not found in Russell Fork

Although there were 56 historical collection sites in the Russell Fork, many of the original field data sheets indicated incomplete sampling, many different collecting methods, and imprecise locality information. Therefore, we do not have an adequate knowledge of the Russell Fork fish fauna. Since no comprehensive fish survey of the system has ever been conducted, it is difficult to determine the extent to which human activity has impacted the ichthyofauna of Russell Fork. The primary goal of this study was to conduct the first comprehensive survey of the Russell Fork system. This goal was achieved by accomplishing the following objectives:

1. Resample all historical collection sites on the Russell Fork system;
2. Sample additional sites so that the entire system is well represented;
3. Provide baseline distribution data for future assessments and/or remediation;
4. Note differences between species reported in previous collections and this study, and offer explanations for differences;
5. Identify and explain biogeographic trends in the Russell Fork; and
6. Note unique features that may be in need of protection and/or further study (habitat, unique fauna, etc.).

METHODS

Site Selection

All known historical localities (n = 56) were revisited. Seven historical localities were not resampled due to poor habitat (degradation, small stream size, and/or no fish reported by previous collectors) or proximity to other sites. An additional 36 sites were sampled to insure that representative habitats in all major tributaries of the Russell Fork system were adequately sampled (Fig. 1, Appendix A).

Sampling

Collections were made generally following protocols outlined by Kentucky Division of Water (KDOW) (1993). This required subjective use of seines of various sizes and electrofishing gear in all suitable fish habitats at a given site. Snorkel surveying was also done at Sites 19 and 24 to search for species not likely to be captured by other methods. A trammel net was set at Site 19 and boat electrofishing was done at Sites 4 and 17 to capture larger species that are not likely to be regularly collected by seining. Voucher specimens were retained from each site in approximate proportion to their abundance. Specimens were preserved in 10% formalin for at least one week. The samples were then rinsed in tap water, transferred into 70% ethanol, and identified using Jenkins and Burkhead (1993) and Etnier and Starnes (1993). All voucher specimens were catalogued into the permanent research collection at the Branson Museum of Zoology at Eastern Kentucky University. Original sorting sheets were also stored at the Branson Museum.

Data Analysis

Data analysis was divided into two main components: trends in species presence/absence data and biogeographic trends. The trends in species presence/absence data were analyzed by plotting all historical records against the 1998 data. New records, trends, and omissions were noted and explained in the Results and Discussion. Also, in an effort to be consistent with the most frequently cited publication regarding fishes in Kentucky (Burr and Warren, 1986), each species was identified as being generally distributed, occasional, or sporadic (Table 2) in each subsystem of the Russell Fork system from which it is known following the definitions of Smith (1965) as used by Burr and Warren (1986). The species occurrence index was based upon the proportion of sites in a given subsystem in which the species was found. Only sites containing suitable habitat and sampled with methods appropriate for collecting that species were used to evaluate the species' incidence. Species were determined to be sporadic if collected in less than 1/3 of suitable sites, occasional if taken at 1/3 -2/3 of such sites, and generally distributed if found at more than 2/3 of all suitable sites.

Distribution maps for each species were examined for biogeographic trends. Trends were noted and explained in the results and discussion. Jaccard's coefficients of community similarity (Krebs, 1989) were calculated at four sites adjacent to an hypothesized barrier to fish migration (Leftwich et al., 1994). The coefficients were compared to determine if there were shifts in community similarity at the hypothesized barrier.

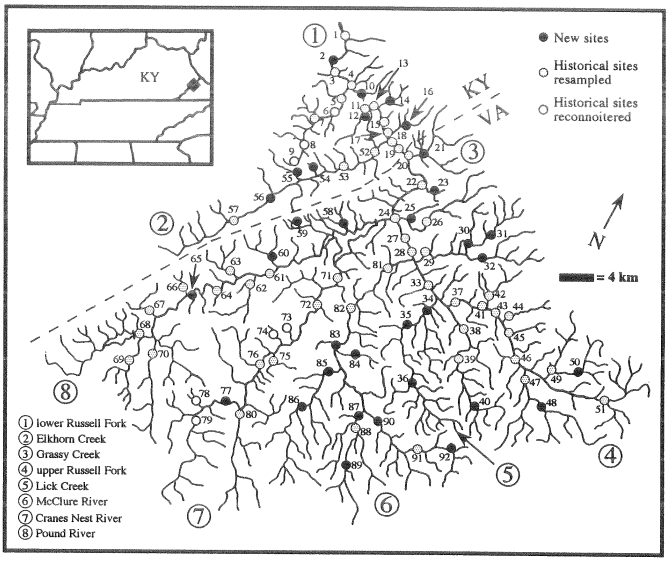

Figure 1. Map of Russell Fork system and all collection sites.

Table 2. Terminology and definitions regarding the distribution of fish species in the Russell Fork system [from Smith (1965) and Burr and Warren (1986)].

Generally distributed - implies that any suitable habitat within the prescribed area should be expected to yield specimens with a reasonably thorough search.
Occasional - implies that suitable-appearing habitat may or may not yield specimens even after prolonged search.
Sporadic - implies that encountering specimens of a given taxon can not be predicted at all.

RESULTS AND DISCUSSION

Sixty-five species were collected in this study. Thirty-eight species were collected from the Virginia portion of the system, while 61 species were collected from the Kentucky portion. The five most generally distributed species were *Campostoma anomalum* (74 sites), *Hypentelium nigricans* (62 sites), *Luxilus chrysocephalus* (53 sites), *Rhinichthys atratulus* (53 sites), and *Semotilus atromaculatus* (48 sites).

Of the 74 fish species previously reported from the Russell Fork, seven are considered probable misidentifications, reducing the total to 67 species known from historical collections in the Russell Fork. Eight of these species were not collected in 1998. However, the collection of six species not previously reported from the Russell Fork system brings the total number known to 73, of which nine were probably introduced and another possibly introduced.

Notable Sites

Forty species, including seven darters and *Noturus stigmosus*, listed as a species of "Special Concern" by Kentucky Nature Preserves Commission (KNPC) (1996), were obtained in two collections made at Site 4. A collection by seining produced 24 species, and a boat electrofishing collection added 16 more species. Site 2 yielded a total of 37 species, including 10 darters, in two collections using seines. Twenty-six species were collected from Site 11, including nine darters and *N. stigmosus*. A total of 25 species, including 10 darters, was collected at Site 18 using seines.

Species Accounts

The following annotations document the occurrence of all species considered to be correctly reported from 92 sites (Fig. 1, Appendix A) in the Russell Fork system. Localities of collections made during this study are in bold. All species are considered native unless otherwise noted.

Petromyzontidae

Ichthyomyzon unicuspis Hubbs and Trautman, silver lamprey. Site **17**. Sporadic in lower Russell Fork. Known only from one specimen. New Levisa Fork system record.

Lampetra appendix (DeKay), American brook lamprey. 1. Sporadic in lower Russell Fork.

Lepisosteidae

Lepisosteus osseus (Linnaeus), longnose gar. **2**, **4**, 13, **17**. Occasional in lower Russell Fork.

Anguillidae

Anguilla rostrata (Lesueur), American eel. 18. Sporadic in lower Russell Fork.

Clupeidae

Dorosoma cepedianum (Lesueur), gizzard shad. 1, **4**, **11**, **17**, 53, **57**. Occasional in lower Russell Fork. Sporadic in Elkhorn Creek.

Salmonidae

Oncorhynchus mykiss (Walbaum), rainbow trout. 18, 20, **22**, 24, **38**, **40**, **49**, **58**, **61**, **75**. Introduced. Sporadic in lower and upper Russell Fork, Cranes Nest, and Pound rivers.

Salmo trutta (Linnaeus), brown trout. 19, 24, 39, **60**, **68**, **72**, **75**. Introduced. Sporadic in lower and upper Russell Fork, and Cranes Nest and Pound rivers.

Cyprinidae

Campostoma anomalum (Rafinesque), central stoneroller. Known from all sites except 6, 8, 9, 15, 25, 26, 54, 59, 73, 74, 78, 79, 83. Generally distributed throughout the Russell Fork system.

Clinostomus funduloides (Girard), rosyside dace. **21**. Possibly introduced due to proximity of bait retailer to collection site and absence from other sites. However, this species is known from other sites in Levisa Fork system. Sporadic. Known only from Grassy Creek. New Russell Fork system record.

Cyprinella galactura (Cope), whitetail shiner. **1**, **2**, **3**, **4**, **10**, **11**, **13**, **18**, **19**, **20**, **22**, **24**, **25**, **27**, **28**, **29**, **33**, **35**, **36**, **37**, **38**, **41**, **42**, **43**, 44, **45**, **46**, **47**, **48**, **49**, **50**, 51, **52**, **53**, **56**, **61**, **64**, **65**, 68, **72**, 74, 75, **76**, **80**, **81**, **82**, **83**, **85**, **86**, **87**, **88**, **90**. Generally distributed in lower and upper Russell Fork, Lick Creek, and McClure River. Occasional in Elkhorn Creek, Cranes Nest and Pound rivers.

Cyprinella spiloptera (Cope), spotfin shiner. **1**, **2**, **3**, **4**, **10**, **11**, **13**, **15**, 17, **18**. Generally distributed in lower Russell Fork.

Cyprinella whipplei Girard, steelcolor shiner. 1, **2**, **3**, **10**, 13, 17, 18, 19. Occasional in lower Russell Fork.

Cyprinus carpio Linnaeus, common carp. 1, **4**, 10, 15, **17**, 18, 19, 41. Introduced. Occasional in lower Russell Fork. Sporadic in upper Russell Fork.

Ericymba buccata Cope, silverjaw minnow. 1, **2**, **3**, **4**, 5, 6, 7, **10**, 15, **18**, **19**, **22**, **24**, **27**, 29, **30**, **32**, 37, **42**, 43, 44, **46**, 47, **53**, **56**, **60**, 61, **66**, **69**, 70, 71, 72, 75, 76, **80**, 82. Occasional in lower and upper Russell Fork and Elkhorn Creek. Sporadic in McClure, Cranes Nest, and Pound rivers.

Erimystax dissimilis (Kirtland), streamline chub. 1, **2**, **3**, **4**, **10**, **11**, 13, 15, 17, 19, 20. Occasional in lower Russell Fork.

Luxilus chrysocephalus Rafinesque, striped shiner. Known from all sites except 6, 7, 8, 9, 10, 12, 14, 21, 23, 26, 39, 40, 48, 49, 51, 54, 55, 58, 59, 63, 66, 73, 78, 79, 83, 84, 86, 89, 91, 92. Generally distributed throughout Russell Fork drainage.

Macrhybopsis aestivalis (Girard), speckled chub. **1**, **2**, **3**, **4**, **10**. Occasional in lower Russell Fork.

Nocomis micropogon (Cope), river chub. 17, 29, 68. Probably extirpated from Russell Fork system.

Notropis ludibundus (Girard), sand shiner. 1, 4, **11**, **13**, **15**, **18**, 19, 20, **22**, **24**, 27, 28, 29, 33, 37, **41**, 42, **43**, **44**, 45, **46**, **52**, 53, **56**, **72**. Occasional in lower and upper Russell Fork and Elkhorn Creek. Sporadic in Cranes Nest River.

Notropis photogenis (Cope), silver shiner. **1**, **2**, **3**, **4**, **10**, **11**, **13**, **15**, **17**, **18**, 52, **53**, **56**. Generally distributed in lower Russell Fork. Occasional in Elkhorn Creek.

Notropis rubellus (Agassiz), rosyface shiner. **1**, **2**, **3**, **4**, **10**, **11**, **12**, **13**, **15**, 17, **18**, **19**, **20**, **22**, **24**, **25**, **27**, **28**, 29, **33**, **34**, **35**, **37**, **38**, **41**, **42**, **43**, 44, **45**, **46**, **47**, **49**, 52, **53**, **56**, **61**, **64**, **65**, **71**, **72**, 74, **81**, **82**, **83**, **85**, **87**. Generally distributed in lower and upper Russell Fork and McClure River. Occasional in Elkhorn and Lick creeks and Pound and Cranes Nest rivers.

Notropis volucellus (Cope), mimic shiner. **1**, **2**, **3**, **4**, **10**, **11**, **13**, **15**, **18**, 19, **53**. Generally distributed in lower Russell Fork. Sporadic in Elkhorn Creek.

Phenacobius mirabilis (Girard), suckermouth minnow. **2**, **3**, **4**, 6, 7, **11**, 52, 53. Sporadic in lower Russell Fork and Elkhorn Creek.

Phoxinus oreas (Cope), mountain redbelly dace. **21**. Probably introduced due to proximity of a bait dealer to collection site and absence from the rest of the Big Sandy drainage. Known only from two specimens taken from Grassy Creek. New Big Sandy drainage record.

Pimephales notatus (Rafinesque), bluntnose minnow. **1**, **2**, **3**, **4**, **10**, **11**, **13**, **15**, 16, 17, **18**, **19**, **20**, **22**, **24**, **25**, **27**, **28**, **29**, **30**, **32**, **33**, **34**, 37, 38, **41**, **42**, **43**, 44, **45**, **46**, **47**, **50**, **52**, **53**, **56**, **57**, **58**, **61**, **64**, **67**, **68**, **71**, **72**, **75**, **76**, 79, **80**, 81, 82, **86**, **88**. Generally distributed in lower and upper Russell Fork and Elkhorn Creek. Occasional in Lick Creek. Sporadic in McClure, Pound and Cranes Nest rivers.

Rhinichthys atratulus (Hermann), blacknose dace. Known from all sites except 1, 2, 3, 9, 10, 12, 13, 15, 16, 17, 18, 28, 30, 34, 36, 41, 45, 53, 59, 61, 64, 65, 71, 73, 78, 82, 83, 85, 87. Generally distributed throughout Russell Fork drainage except for Lick Creek where it is occasional.

Rhinichthys cataractae (Valenciennes), longnose dace. 19. Probably introduced. Known only from lower Russell Fork near the Virginia border.

Semotilus atromaculatus (Mitchill), creek chub. Known from all sites except 1, 3, 10, 11, 13, 15, 17, 18, 24, 27, 28, 29, 30, 34, 37, 38, 39, 41, 43, 45, 48, 51, 52, 53, 65, 73, 81, 82, 83, 85, 86, 90. Generally distributed throughout Russell Fork drainage.

Catostomidae

Carpiodes cyprinus (Lesueur), quillback. 1, **4**, **10**, 13, 15, **17**, 18, **19**. Occasional in lower Russell Fork.

Catostomus commersoni (Lacepede), white sucker. 4, **5**, **7**, **14**, **18**, 20, 22, 24, **25**, **29**, **32**, **36**, **38**, **40**, 42, 51, **52**, **53**, **55**, **56**, **57**, **58**, **60**, 61, **62**, 67, **69**, **70**, 72, 75, 76, **77**, 79, **80**, **91**, **92**. Generally distributed in Elkhorn Creek. Occasional in lower and upper Russell Fork, Lick Creek, and Pound and Cranes Nest rivers. Sporadic in McClure River.

Hypentelium nigricans (Lesueur), northern hogsucker. Known from all sites except 3, 6, 8, 9, 12, 14, 16, 21, 23, 26, 31, 40, 54, 55, 59, 60, 67, 71, 73, 74, 78, 83, 84, 92. Generally distributed throughout the Russell Fork drainage.

Ictiobus bubalus (Rafinesque), smallmouth buffalo. 18. Sporadic in lower Russell Fork.

Moxostoma anisurum (Rafinesque), silver redhorse. **2**, **4**, 13, 15, **17**, 18, 19. Occasional in lower Russell Fork.

Moxostoma carinatum (Cope), river redhorse. **4**, 15, **17**, **19**. Occasional in lower Russell Fork.

Moxostoma duquesnei (Lesueur), black redhorse. 1, **4**, 13, 15, **17**, 18, 19. Occasional in lower Russell Fork.

Moxostoma erythrurum (Rafinesque), golden redhorse. 1, **4**, **5**, **7**, **10**, 13, 15, **17**, 18, 19. Occasional in lower Russell Fork.

Moxostoma macrolepidotum (Lesueur), shorthead redhorse. 1, **4**, **11**, 13, 15, **17**, 18, 19. Occasional in lower Russell Fork.

Ictaluridae

Ameiurus natalis (Lesueur), yellow bullhead. **4**, **5**, 37, 46, **57**, **58**, **64**, **72**. Sporadic in lower and upper Russell Fork, Elkhorn Creek, and Pound and Cranes Nest rivers.

Ictalurus punctatus (Rafinesque), channel catfish. **3**, **4**, 15, **17**, 18, 19, 20, 22, 24, **52**. Sporadic in lower and upper Russell Fork and Elkhorn Creek.

Noturus eleutherus (Jordan), mountain madtom. **2**, **4**. Sporadic in lower Russell Fork.

Noturus flavus Rafinesque, stonecat. **33**, **41**. Sporadic in upper Russell Fork. New Levisa Fork system record.

Noturus stigmosus Taylor, northern madtom. **4**, **11**. Sporadic in lower Russell Fork. New Russell Fork system record.

Pylodictis olivaris (Rafinesque), flathead catfish. **2**, **4**, **17**, 22, **24**. Sporadic in lower and upper Russell Fork.

Atherinidae

Labidesthes sicculus (Cope), brook silverside. 1, **2**, **11**, 17. Sporadic in lower Russell Fork.

Cottidae

Cottus bairdi Girard, mottled sculpin. **36**, **58**, **60**, **61**, **63**, **64**, **66**, 80, **86**, **87**, **88**, **89**, **91**, **92**. Occasional in McClure and Pound rivers. Sporadic in upper Russell Fork and Cranes Nest River.

Moronidae

Morone chrysops (Rafinesque), white bass. Introduced. Known only from North Fork Pound River Reservoir.

Centrarchidae

Ambloplites rupestris (Rafinesque), rockbass. **1**, **2**, **4**, **11**, **18**, **19**, **22**, **24**, 27, **28**, **29**, **31**, **32**, **33**, **34**, **35**, **36**, **37**, **38**, **41**, **42**, **43**, **44**, **45**, 46, **47**, **48**, **49**, **50**, **52**, **53**, 61, **64**, **66**, **67**, **68**, **70**, **80**, **81**, **82**, **83**, **84**, **85**, **87**, **88**, **90**, **91**. Generally distributed in upper Russell Fork, Lick Creek, and McClure River. Occasional in lower Russell Fork, Elkhorn Creek, and Pound River. Sporadic in Cranes Nest River.

Lepomis auritus (Linnaeus), redbreast sunfish. **2**, **20**, **22**, **24**, **27**, 28, **29**, **32**, **33**, **35**, **36**, **37**, **38**, **41**, **43**, **45**, **46**, **47**, **49**, **50**, **52**, **62**, **64**, **65**, **67**, **69**, 70, **72**, **77**, **80**, **81**, **82**, **85**. Introduced. Generally distributed in upper Russell Fork. Occasional in Lick Creek, and McClure, Cranes Nest and Pound rivers. Sporadic in lower Russell Fork and Elkhorn Creek. New Kentucky Russell Fork system record.

Lepomis cyanellus Rafinesque, green sunfish. 22, 52, **53**, **69**, **85**. Sporadic in upper Russell Fork, Elkhorn Creek, and McClure and Pound rivers.

Lepomis macrochirus Rafinesque, bluegill. 13, 15, 18, 19, **29**, 37, 42, 46, **58**, **60**, **61**, **62**, **64**, **68**, **69**, **70**, 71, 72, **75**, **76**, **77**, **80**. Generally distributed in Pound River. Occasional in Cranes Nest River. Sporadic in lower and upper Russell Fork.

Lepomis megalotis (Rafinesque), longear sunfish. 1, **4**, 13, 15, **17**. Sporadic in lower Russell Fork.

Lepomis microlophus (Guenther), redear sunfish. 24, **80**. Introduced. Sporadic in upper Russell Fork and Cranes Nest River.

Micropterus dolomieu Lacepede, smallmouth bass. **2**, **4**, **10**, **11**, 13, 15, **17**, **18**, **19**, **20**, **22**, **24**, **27**, **28**, **29**, **32**, 33, **36**, **37**, **41**, **43**, **44**, **45**, 46, **49**, **52**, **53**, **58**, **81**, **82**, **85**, **87**. Generally distributed in lower and upper Russell Fork. Occasional in Elkhorn and Lick creeks, and McClure River. Sporadic in Pound River.

Micropterus punctulatus (Rafinesque), spotted bass. 1, **2**, **4**, 6, 13, 15, 18, 19, 22, 33, **36**, 37, 41, **43**, 46, **61**, **70**, **72**, **86**. Sporadic in upper and lower Russell Fork, Lick Creek, and McClure, Cranes Nest, and Pound rivers.

Micropterus salmoides (Lacepede), largemouth bass. **1**, **2**, 18, 19, 42, **56**, 64, 70, 71, 72, 76. Sporadic in lower and upper Russell Fork, Elkhorn Creek, Cranes Nest and Pound rivers.

Pomoxis annularis Rafinesque, white crappie. **4**, 18, 19, 22. Sporadic in lower and upper Russell Fork.

Pomoxis nigromaculatus (Lesueur), black crappie. Introduced. Known only from North Fork Pound River Reservoir.

Percidae

Ammocrypta pellucida (Putnam), eastern sand darter. 18. Probably extirpated from Russell Fork system.

Etheostoma blennioides Rafinesque, greenside darter. **1**, **2**, **3**, **4**, **10**, 15, **16**, 17, **18**, **19**, **20**, **52**, **55**, **57**. Generally distributed in lower Russell Fork. Occasional in Elkhorn Creek.

Etheostoma caeruleum Storer, rainbow darter. **2**, **3**, **4**, **10**, **11**, **12**, **13**, **15**, **16**, 17, **18**, **19**, **20**, 22, 24, **25**, 27, **28**, **33**, **34**, **35**, **36**, **37**, **38**, **41**, **42**, **43**, **44**, **45**, **46**, **47**, **48**, **50**, **52**, **81**. Generally distributed in lower and upper Russell Fork and Lick Creek. Sporadic in most downstream reaches of Elkhorn Creek and McClure River.

Etheostoma flabellare Rafinesque, fantail darter. **18**, 19, **33**, **34**, **35**, **36**, **37**. Sporadic in lower Russell Fork. Known only from sites near Lick Creek in upper Russell Fork. Generally distributed in Lick Creek.

Etheostoma nigrum Rafinesque, johnny darter. **2**, **10**, **13**, **18**, 19, 52, **58**, **60**, **61**, **62**, **63**, **64**, **67**, **68**, **69**, **71**, 72, **75**, **76**, **77**, **80**. Sporadic in lower Russell Fork and Elkhorn Creek. Generally distributed in Cranes Nest and Pound rivers. New Virginia Russell Fork system record.

Etheostoma simoterum (Cope), Tennessee snubnose darter. **13**, **18**, **19**, **20**, **22**, **24**, **25**, **27**, **28**, **33**, **81**, **82**, **83**, **85**, **86**, **87**, **88**, **90**, **91**, **92**. Sporadic in lower and upper Russell Fork. Generally distributed in McClure River. Only known Kentucky population of *E. s. simoterum*. All other Kentucky populations of this species are in Cumberland River drainage and typical of *E. s. atripinne* (Burr and Warren, 1986).

Etheostoma variatum Kirtland, variegate darter. **1**, **2**, **3**, **4**, 7, **10**, **11**, **13**, 15, 17, **18**, **19**, **20**, **52**. Generally distributed in lower Russell Fork. Sporadic in Elkhorn Creek. Listed as State Endangered in Virginia (Jenkins and Burkhead, 1993). Not collected within Virginia portion of Russell Fork, but five individuals were collected within 100 m of Virginia border. Therefore, it is likely that there are individuals living in Russell Fork between cascades in the Breaks Canyon and Kentucky border.

Etheostoma zonale (Cope), banded darter. **1**, **2**, **3**, **4**, **10**, **11**, **13**, **15**, 17, **18**, **19**, **20**, **52**. Generally distributed in lower Russell Fork. Sporadic in Elkhorn Creek.

Percina caprodes (Rafinesque), logperch. 1, **2**, **4**, **11**, **13**, 17, **18**, **19**, **20**, **52**. Occasional in lower Russell Fork. Sporadic in Elkhorn Creek.

Percina copelandi (Jordan), channel darter. **2**, **11**, 17. Sporadic in lower Russell Fork.

Percina evides (Jordan and Copeland), gilt darter. **2**, **3**, **4**, **10**, **11**, **13**, **18**. Occasional in lower Russell Fork.

Percina maculata (Girard), blackside darter. **2**, 15, 17, 18, **19**, **20**. Sporadic in lower Russell Fork. Three individuals were collected upstream of the Virginia border, reconfirming Leftwich et al.'s (1994) rediscovery of species in Virginia after nearly 60 year absence (Jenkins and Burkhead, 1993). Only known extant population of *P. maculata* in Virginia.

Percina oxyrhyncha (Hubbs and Raney), sharpnose darter. **11**, 18, **19**, **20**, **22**, **24**, 28, **33**, **35**, **37**, 38, **41**, **43**, **50**, **61**, **65**, **72**, 82. Occasional in upper Russell Fork and Pound River. Sporadic in lower Russell Fork, Lick Creek, and McClure and Cranes Nest rivers.

Percina sciera (Swain), dusky darter. **2**, **3**, **4**, **10**, **11**, **13**, 15, **18**. Occasional in lower Russell Fork.

Stizostedion canadense (Smith), sauger. **4**, **17**. Sporadic in lower Russell Fork.

Stizostedion vitreum (Mitchill), walleye. **17**, **19**, 20. Sporadic in lower Russell Fork.

Species Not Collected

Fifteen species previously reported from the Russell Fork were not collected during this study. Five of these species are considered to represent valid records of native populations, while three species are probably introduced, and seven species are considered misidentifications. Furthermore, two species known from the lower Russell Fork system were erroneously reported from the upper Russell Fork.

Kirkwood (1957) reported *Lampetra appendix* from the Russell Fork. Since lampreys are sometimes difficult to collect even when present, and *L. appendix* is known from other portions of the Big Sandy drainage, their absence from this study does not necessarily indicate extirpation. *Anguilla rostrata* and *Ictiobus bubalus* are large river species that were reported in the Russell Fork by Clark (1941). Their absence from this study also does not indicate extirpation since they are both difficult to collect with conventional methods. They might be collected in future surveys conducted during a different time of year and more intensively using riverine sampling methods (i.e., boat electrofishing, gill/trammel net sampling).

Nocomis micropogon and *Ammocrypta pellucida* were reported in early Russell Fork collections (Jenkins and Burkhead, 1993; Clark, 1941; Turner, 1961; Woolman, 1892). However, *N. micropogon* has not been collected in the Russell Fork since 1960 (Turner, 1961), and *A. pellucida* has not been collected since 1937 (Clark, 1941). Because these are both species that are often collected when present, failure to collect them during this study suggests their extirpation from the Russell Fork system.

Morone chrysops and *Pomoxis nigromaculatus* have only been collected in the North Fork Pound River Reservoir. Both species were stocked as game fish (Jenkins and Burkhead, 1993) and probably rarely leave the impoundment. *Rhinichthys*

cataractae was collected from the Russell Fork, 1.2 km downstream of the Virginia state line (Site 19) in 1984 (Stephens and Prather, 1985). Because fishermen regularly visit the area where *R. cataractae* was collected in 1984, *R. cataractae* was probably a bait bucket transfer that might not have survived in the Russell Fork system.

Ichthyomyzon bdellium (Ohio lamprey) was reported from the Russell Fork by Bay (1986). However, no voucher specimen exists for this collection (Robert T. Bay pers. comm.). Because this is the only record of this species from the entire Big Sandy River drainage, and field identification of lampreys can be difficult, we concluded this record was erroneous. For these same reasons, we would not speculate on the correct identity of this record.

Nocomis biguttatus was reported from the Russell Fork by Turner (1961). Because no voucher specimen exists for the collection, and this record would extend the known range of the species over 150 km (Jenkins and Lachner, 1979), we concluded this record was a misidentified *N. micropogon*.

Notropis atherinoides was reported from two sites in the Russell Fork system. Evenhuis (1973) reported capturing one specimen in Elkhorn Creek near the mouth of Pigeon Creek (Site 57). The stream at this location is approximately three meters wide and 15 cm deep. Based on the lack of appropriate habitat and the fact that no voucher specimen was retained for this collection, we concluded that this record was probably a misidentified *N. rubellus*. The fish collection database from the EKU Branson Museum of Zoology included a record of *N. atherinoides* from the Russell Fork at Elkhorn City (Site 18). We have examined all vouchered specimens from this collection, and all are *N. rubellus*.

Pimephales promelas was reported in the Russell Fork by Leftwich et al. (1994). Leftwich et al. (1994) did not report *P. notatus*. During this study, *Pimephales notatus* was collected, and has been found in many collections from the Russell Fork system. Therefore, we concluded that the report of *P. promelas* was a misidentification of *P. notatus*.

Bay (1986) and Turner (1961) reported *Carpiodes velifer* from the Russell Fork. Voucher specimens do not exist for these records (Robert T. Bay and Jim Axon, KDFWR, pers. comm.). Due to the absence of *C. velifer* from this study and others, and the similarity of *C. velifer* to *C. cyprinus,* we concluded that the report of *C. velifer* from the Russell Fork was erroneous.

Ameiurus nebulosus was reported by Virginia Department of Game and Inland Fisheries personnel from Flannagan and North Fork Pound River reservoirs. Jenkins and Burkhead (1993) treated this record as a misidentified *Ameiurus melas* since no voucher specimens were retained, *A. nebulosus* is normally found in lowland areas (Jenkins and Burkhead, 1993) and this record would have represented a significant range extension for *A. nebulosus* (Burr and Warren, 1986; Jenkins and Burkhead, 1993). Based on the fact that no *A. melas* nor *A. nebulosus* were collected during this study, we concluded that this record was probably misidentified *A. natalis* because several were collected in this area.

The only known record of *Notropis volucellus* in the upper Russell Fork drainage was reported from a tributary to the upper Russell Fork by Bay in 1986 and included in Jenkins and Burkhead (1993). No voucher specimen exists for this record. *Notropis ludibundus* is known from several proximate sites. We concluded that Bay's report of *N. volucellus* was based on a misidentified *N. ludibundus*. Without this record, *N. volucellus* has been found only downstream of Breaks Canyon in the Russell Fork system.

Several records of *Lepomis megalotis* from the upper Russell Fork proper and one from the Pound River were cited in Jenkins and Burkhead (1993). All of the upper Russell Fork records were based on field data sheets from Bay. The Pound River record was collected by Jenkins in 1976 and reported on the field data sheet as "one moderate juvenile". No voucher specimens exist for these collections (Robert T. Bay and Robert E. Jenkins, pers. comm.). We concluded that all of the previously mentioned reports of *L. megalotis* are actually misidentified *L. auritus* for the following reasons: 1) *L. megalotis* and *L. auritus* look superficially similar, especially as juveniles; 2) *L. auritus* were commonly collected in the upper Russell Fork during this study, while no *L. megalotis* were found upstream of Breaks Canyon; 3) Bay misidentified several other species in his work in the Russell Fork (Robert E. Jenkins, pers. comm.); 4) Jenkins collected and identified his "*L. megalotis*" before it was widely known that *L. auritus* had been introduced to the drainage; therefore, he would have expected to find *L. megalotis* in an Ohio River tributary, and not expect to find *L. auritus* which is native to Atlantic drainages (Robert E. Jenkins, pers. comm.).

Biogeographical Analysis

The Breaks as a Barrier

The lower 27 rkm of the Russell Fork and Elkhorn Creek have a distinctly different fauna (68 species) than the Russell Fork upstream of the Breaks Canyon (located at rkm 27) (36 species). The difference in these ichthyofaunal communities is illustrated by Jaccard's coefficients of community similarity calculated using data collected from four sites adjacent to Breaks Canyon. The two sites immediately downstream of the canyon, Sites 19 and 20 (Fig. 1) had a Jaccard's coefficient of 0.75. The two sites immediately upstream of the canyon, Sites 22 and 24 (Fig. 1), had a coefficient of 0.88. The coefficients for Sites 19 and 22 as well as for Sites 19 and 24 were 0.60. The coefficients for Sites 20 and 22 as well as for Sites 20 and 24 were 0.55.

Leftwich et al. (1994) hypothesized that the cascades in the Breaks Canyon impose a hydrologic barrier to species not found upstream, thus explaining the difference in fish communities upstream and downstream of Breaks Canyon illustrated by Jaccard's coefficients. This hypothesis is consistent with hypotheses explaining the depauperate faunas of the upper Kanawha (Hocutt et al., 1986) and the upper Cumberland Rivers (Starnes and Etnier, 1986). Jenkins and Burkhead (1993) noted the swift water and bedrock substrate of this section of the Russell Fork, but argued that the cascades did not provide a barrier to upstream movement based on the "recent" discovery of *Ericymba buccata* and *Notropis ludibundus*, two slow water inhabitants in the upper Russell Fork. They cited siltation as the cause of the depauperate fauna of the upper Russell Fork.

We disagree with Jenkins and Burkhead (1993) and support the hydrologic-barrier hypothesis of Leftwich et al. (1994) for the following reasons. First, the recency of the discovery of

Ericymba buccata and *Notropis ludibundus* can be accounted for by the fact that only three collections were made in the upper Russell Fork prior to 1968 (Jenkins and Burkhead, 1993). Secondly, *E. buccata* is also found in the upper Cumberland and Kanawha rivers (Burr and Warren, 1986; Jenkins and Burkhead, 1993) where there is little doubt that barriers to upstream fish movement occur. Also, Breaks Canyon is entirely forested and surrounded by an interstate park and national forest. There are no apparent sources of heavy silt loads or other pollutants in the immediate area that would cause such a dramatic decrease in species richness. Finally, some of the species conspicuously absent from the Russell Fork upstream of Breaks Canyon are considered moderately tolerant to silt and other pollutants (e.g. *Carpiodes cyprinus, Moxostoma erythrurum*) (KDOW, 1997).

While the River Continuum Concept (Vannote et al., 1980) suggests that species richness increases with stream size, the dramatic shift in Jaccard's coefficient values for sites upstream and downstream of the canyon lend further support to the hypothesis that Breaks Canyon acts as a hydrological barrier to upstream fish movements. This hypothesis was also supported by the collection of *Cyprinella spiloptera, Notropis photogenis, Carpiodes cyprinus, Moxostoma anisurum, M. carinatum, M. duquesnei, M. erythrurum, M. macrolepidotum, Etheostoma blennioides, E. variatum, E. zonale, Percina caprodes , P. evides, P. maculata, P. sciera,* and *Stizostedion vitreum* less than 5 rkm downstream of the final large cascade of the Russell Fork in Breaks Canyon. None of these fishes has been collected upstream of Breaks Canyon despite intense sampling in apparently suitable habitat.

Many of the species conspicuously absent from the upper Russell Fork are generally regarded as larger stream species. Conversely, nearly every inhabitant of the upper Russell Fork system is a species that is commonly found in small streams, including *Notropis ludibundus* and *Ericymba buccata.* This pattern is consistent with that of streams containing recognized hydrologic barriers (Hocutt et al., 1986; Starnes and Etnier, 1986).

Disjunctions

Cyprinella galactura and *Etheostoma simoterum* are of uncertain origin in the Russell Fork. Both species are widespread throughout the Tennessee and Cumberland rivers, but have extremely limited distributions in the Ohio River basin (Burr and Warren, 1986; Etnier and Starnes, 1993; Jenkins and Burkhead, 1993). *Cyprinella galactura* is also found in the White and St. Francis rivers (Pflieger, 1997) in Arkansas and Missouri, a disjunction explained by Pleistocene glaciation (Burr and Page, 1986). Other populations are found in the upland portions of the Santee and Savannah rivers of North Carolina, where its disjunct distribution is considered a stream capture transfer (Menhinick, 1991), and the New River in Virginia (Jenkins and Burkhead, 1993) and West Virginia (Stauffer et al., 1995). Jenkins and Burkhead (1993) considered *C. galactura* to be introduced, but possibly native to the New, while Stauffer et al. (1995) argued that *C. galactura* is probably native, but possibly introduced. This fish was found in small numbers near the mouth of the Russell Fork and became progressively more common upstream until it was one of the dominant cyprinids in the system upstream of Breaks Canyon. Except for the population in the New River, this is the only known population of *C. galactura* in the Ohio River basin. Jenkins and Burkhead (1993) considered *Cyprinella galactura* probably introduced, but possibly native, to the Russell Fork, based on the fact that it is found only in the Russell Fork of the Big Sandy drainage. They believed that at least isolated relictual populations of *C. galactura* would have been found in other Big Sandy tributaries if it were native to the drainage. We disagree with the hypothesized introduction by humans based on the fact that *C. galactura* is abundant in the Russell Fork only upstream of Breaks Canyon, where it is the only species of *Cyprinella.* Downstream of the canyon *C. galactura* may face increasing competition from other *Cyprinella,* until it disappears from the Russell Fork fauna near the mouth, thus prohibiting its dispersal to other Big Sandy tributaries. Furthermore, *C. galactura* is a common fish in the Clinch River (Jenkins and Burkhead, 1993). The interdigitating headwaters of the Russell Fork and Clinch tributaries could have provided several possible theaters for stream capture through which *C. galactura* could have been transferred into the Russell Fork from the Clinch River drainage. Finally, Shultz and Reid (Jenkins and Burkhead, 1993) took *C. galactura* in the very first fish collections made within the Russell Fork drainage in 1937. The probability of introduction prior to 1937 seems low.

Etheostoma simoterum is common and widespread throughout the Tennessee and Cumberland rivers (Etnier and Starnes, 1993; Burr and Warren, 1986), but has been discovered in the Bluestone River (New River tributary) and the Russell Fork only within the last 30 years (Jenkins and Burkhead, 1993). Etnier and Starnes (1993) suggested that both of these populations were introduced based on the recency of their discovery. Stauffer et al. (1995) and Jenkins and Burkhead (1993) stated that the Bluestone River populations of *E. simoterum* were possibly introduced, but probably native, due to a lack of collections in the known range of *E. simoterum* prior to its discovery. *Etheostoma simoterum* was considered probably native, but possibly introduced, to the Russell Fork by Jenkins and Burkhead (1993). Since no sites within the present range of *E. simoterum* were sampled prior to its discovery in 1972, the recency of their discovery is uninformative. It appears logical that *E. simoterum* and *C. galactura* were transferred in stream capture events from the Clinch River. The disappearance of *E. simoterum* from the Russell Fork in its lower reaches may be due to the shift to large river habitat and increased competition by other darters not found in the upper Russell Fork system.

The affinity of the Russell Fork fauna to that of the upper Tennessee could be explained by Jillson's (1927) interpretation of the geologic history of the Big Sandy drainage. Stream-worn, quartzite boulders found in the Licking and Big Sandy rivers indicate that at one time, these two rivers were once part of a larger river system that originated in what is now western North Carolina and southwestern Virginia. This ancient river system had its headwaters pirated by the upper Tennessee and Bluestone Rivers during the middle Tertiary period. Soon after that, the stream was bisected again diverting the headwaters north and forming the present Big Sandy River, and leaving the remaining downstream section as the Licking River. Even though these

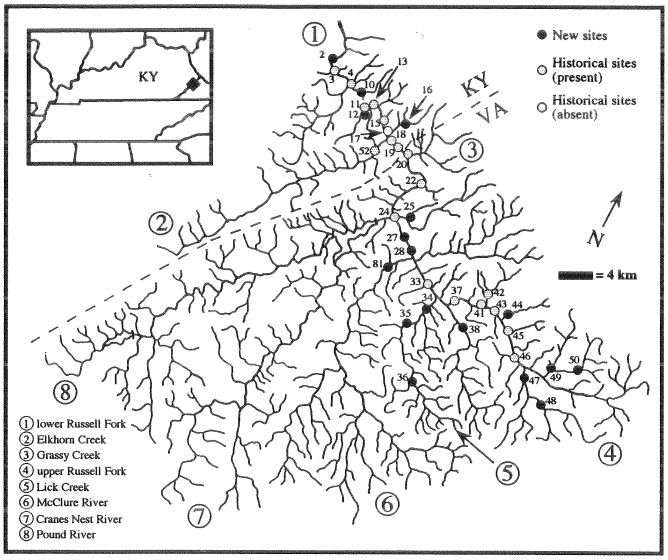

Figure 2. Distribution of *Etheostoma caeruleum* in Russell Fork system.

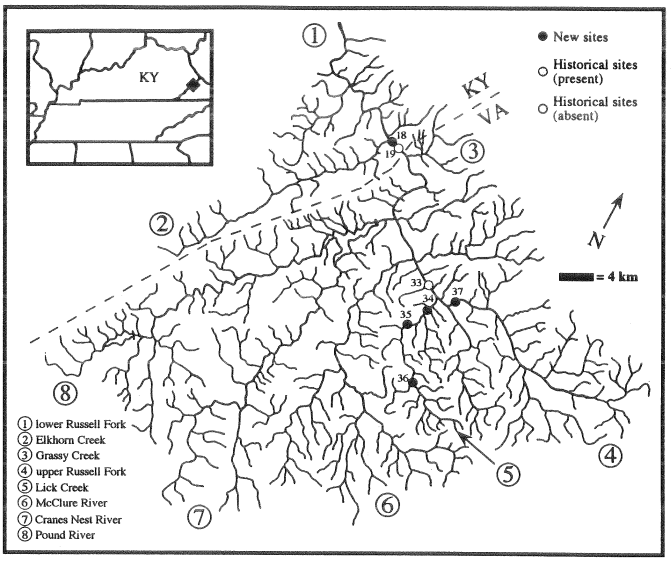

Figure 3. Distribution of *Etheostoma flabellare* in Russell Fork System.

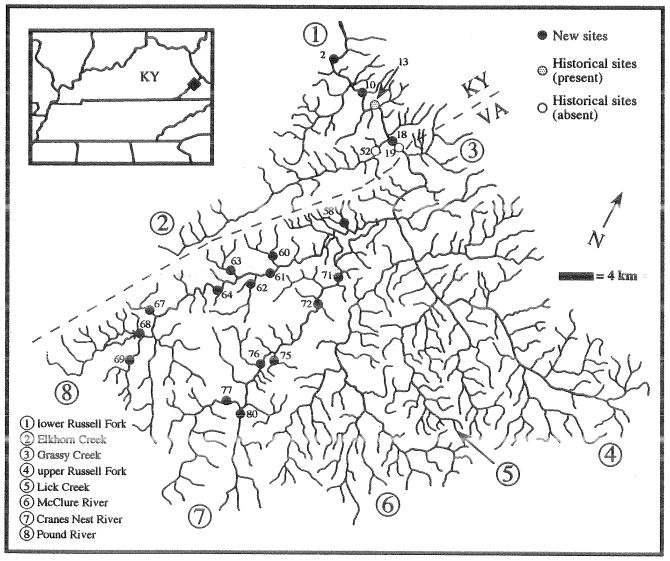

Figure 4. Distribution of *Etheostoma nigrum* in Russell Fork system.

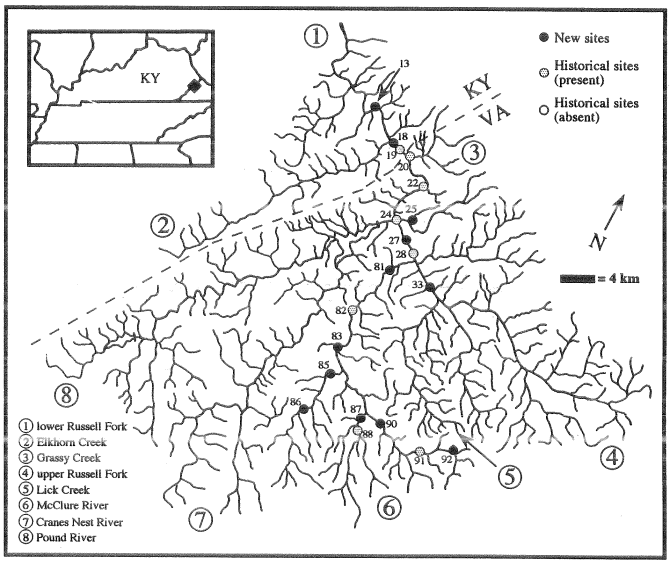

Figure 5. Distribution of *Etheostoma simoterum* in Russell Fork system.

events happened before the appearance of these species, the ancient connections of the main river channels of these rivers left low divides that could have acted as theaters for later stream captures.

Allopatric *Etheostoma*

The distributions of species of *Etheostoma* in the upper tributaries of the Russell Fork also present an interesting biogeographic question. *Etheostoma caeruleum* is common in the Russell Fork proper upstream of its confluence with the McClure River (Fig. 2). However, the only other species of *Etheostoma* inhabiting this area is *E. flabellare*. *Etheostoma flabellare* is largely restricted to Lick Creek in the upper Russell Fork (Fig. 3). *Etheostoma nigrum* is common in the Pound and Cranes Nest rivers and is the only *Etheostoma* known from these two systems (Fig. 4). It has not been collected from any other locality upstream of Breaks Canyon. *Etheostoma simoterum* is common in the McClure River (Fig. 5). No other *Etheostoma* species is known from most of the McClure system. All of these species are found in sympatry in the Russell Fork downstream of Breaks Canyon and throughout a large portion of their ranges (Page, 1983). There are no cascades that could act as a barrier to dispersal in the upper Russell Fork. Ideal habitat for each species appears plentiful throughout all major tributaries of the Russell Fork. The reason for their allopatry in the Russell Fork remains a mystery.

ACKNOWLEDGMENTS

We thank M. R. Thomas, R. E. Blanton, J. A. Thomas, J. M. Ray, D. M. Jones, T. E. Hagman, D. R. Peake, D. C. Fields, A. C. Shepard, J. R. Stapleton, D. R. Spangler, G. P. Hoagland, M. L. Matthews, T. S. Hansell, S. J. Ruth, and D. A. Allnutt for field work on this project. We also thank D. R. Michaelson and Kentucky Department of Fish and Wildlife Resources for providing equipment and help boatshocking. We thank Robert Bay, Jim Axon, Ron Cicerello and Brooks Burr for help locating historical information and voucher specimens. We especially thank Robert E. Jenkins for providing us historical data from Virginia. Finally, we thank the Bluegrass Wildwater Association for funding this project. Steven L. Powers submitted this research in partial fulfillment of the requirements for the Master of Science degree in the Department of Biological Sciences, Eastern Kentucky University.

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Appendix A. Site localities and dates sampled of all sites surveyed in 1998.

1. Russell Fork 1 km S Millard at Powell Creek confluence off US Hwy 460. Pike Co., KY. 14 August.
2. Russell Fork at Winwright Station off US Hwy 460. Pike Co., KY. 14 August, 6 November.
3. Russell Fork 3 km NW of Marrowbone at private bridge off US Hwy 460. Pike Co., KY. 13 August.
4[1]. Russell Fork at Marrowbone off US Hwy 460. Pike, Co., KY. 13 August, 24 August.
5. Marrowbone Creek at Marrowbone Fire Dept. off KY Hwy 195. Pike Co., KY. 6 May.
6*. Marrowbone Creek at Dry Fork off KY Hwy 195. Pike Co., KY.
7. Marrowbone Creek at Rockhouse off KY Hwy 195. Pike Co., KY. 6 May.
8*. Marrowbone Creek at Hellier off KY Hwy 195. Pike Co., KY.
9*. Marrowbone Creek at Allegheny off Allegheny Rd. Pike Co., KY.
10. Russell Fork 2 km N Draffin along unmarked dirt road off Pond Creek Rd. Pike Co., KY. 14 August.
11. Russell Fork at Draffin off Pond Creek Rd. bridge. Pike Co., KY. 25 August, 6 November.
12. Pond Creek at Draffin off Pond Creek Rd. bridge. Pike Co., KY. 3 July.
13. Russell Fork 2 km SE Draffin upstream of concrete bridge off US Hwy 460. Pike Co., KY. 13 August.
14. Ferrell Creek 1 km NE Belcher off Old Ferrell Creek Rd. Pike Co., KY. 1 July.
15. Russell Fork at Beaver Bottom off KY Hwy 80. Pike Co., KY. 13 August.
16. Beaver Creek at Beaver Bottom off Beaver Bottom Rd. Pike Co., KY. 16 July.
17[1]. Russell Fork 1 km N Elkhorn City at unnamed dirt road along river. Pike Co., KY. 24 August.
18. Russell Fork at Elkhorn City under KY Hwy 80 bridge. Pike Co., KY. 25 July.
19[2, 3]. Russell Fork 3 km SE Elkhorn City at river access off KY Hwy 80. Pike Co., KY. 14 August, 4 September, 5 September.
20. Russell Fork at VA/KY state line off KY Hwy 80. Pike Co., KY / Dickenson Co., VA. 5 September.
21. Grassy Creek 3 km E Breaks at hiking trail off KY Hwy 80. Buchanan Co., VA. 6 May.
22. Russell Fork at Garden Hole in Breaks Interstate Park off VA Hwy 80. Dickenson Co., VA. 2 October.
23. Camp Branch at Garden Hole Rd. in Breaks Interstate Park off VA Hwy 80. Dickenson Co., VA. 3 July.
24[3]. Russell Fork at Bartlick off Co. Hwy 611. Dickenson Co., VA. 4 September.
25. Barts Lick Creek at Bartlick off Co. Hwy 611. Dickenson Co., VA. 15 May.
26. Barts Lick Creek 2 km S Breaks Interstate Park entrance off Co. Hwy 80. Dickenson Co., VA. 2 July.
27. Russell Fork at Splashdam off Co. Hwy 613. Dickenson Co., VA. 4 September.
28. Russell Fork at Haysi downstream of VA Hwy 63 bridge. Dickenson Co., VA. 4 September.
29. Russell Prater Creek 3 km E Haysi along VA Hwy 83. Dickenson Co., VA. 19 July.
30. Greenbriar Creek 2.5 km NW Vicey at junction of Co. Hwy 611 & 608. Buchanan Co., VA. 2 July.
31. Greenbriar Creek 3 km NE Vicey off Co. Hwy 608. Buchanan Co., VA. 24 July.
32. Russell Prater Creek at Vicey along VA Hwy 83. Buchanan Co., VA. 19 July.
33. Russell Fork 1 km NW Birchleaf off VA Hwy 80. Dickenson Co., VA. 5 September.
34. Lick Creek 1 km SW Birchleaf off Co. Hwy 670. Dickenson Co., VA. 14 May.
35. Lick Creek 5 km SW Birchleaf off Co. Hwy 670. Dickenson Co., VA. 16 July.
36. Lick Creek 2 km NW Aily off Co. Hwy 670. Dickenson Co., VA. 7 November.
37. Russell Fork 3 km SE Birchleaf off Co. Hwy 605. Dickenson Co., VA. 15 May.
38. Fryingpan Creek 2.5 km SE Colley off VA Hwy 80. Dickenson Co., VA. 14 May.
39. Fryingpan Creek 1 km N of Tiny off Co. Hwy 625. Dickenson Co., VA. 2 October.
40. Fryingpan Creek at Bucu off Co. Hwy 600. Dickenson Co., VA. 7 November.
41. Russell Fork 2 km E Cannady off Co. Hwy 605. Buchanan Co., VA. 2 October.
42. Pawpaw Creek at Cannady off Co. Hwy 605. Buchanan Co., VA. 2 July.
43. Russell Fork 2 km SE Cannady off Co. Hwy 605. Buchanan Co., VA. 2 October.
44. Fox Creek 2 km SE Cannady at Co. Hwy 605 bridge. Buchanan Co., VA. 24 July.
45. Russell Fork 2 km NW Murphy off Co. Hwy 605. Buchanan Co., VA. 7 November.
46. Russell Fork 2 km SE Murphy off VA Hwy 80. Buchanan Co., VA. 14 May.
47. Indian Creek 3 km N Duty at Co. Hwy 602 bridge. Buchanan Co., VA. 25 July.
48. Indian Creek 1 km E Duty off Co. Hwy 602. Buchanan Co., VA. 7 November.
49. Hurricane Creek 1 km N Davenport off Co. Hwy 600. Buchanan Co., VA. 25 July.
50. Hurricane Creek 3 km NE Davenport off Co. Hwy 600. Buchanan Co., VA. 7 November.
51. Russell Fork at Council off VA Hwy 80. Buchanan Co., VA. 14 May.
52. Elkhorn Creek 2 km SW Elkhorn City off KY Hwy 197. Pike Co., KY. 18 July.
53. Elkhorn Creek 6 km SW Elkhorn City off KY Hwy 197. Pike Co., KY. 18 July.
54. Ashcamp Branch 1 km N Ashcamp off Ashcamp Branch Rd. Pike Co., KY. 18 July.
55. Sycamore Creek 6 km SW Ashcamp off Sycamore Creek Rd. Pike Co., KY. 3 July.
56. Elkhorn Creek at Hylton off KY Hwy 197. Pike Co., KY. 18 July.

57. Elkhorn Creek 2 km SW Shelby Gap off KY Hwy 197. Pike Co., KY. 18 July.
58. Upper Twin Branch 4 km SW Tivis off Co. Hwy 611. Dickenson Co., VA. 4 June, 18 July.
59. Unnamed tributary to Cane Creek 2 km SW Blowing Rock at Co. Hwy 611 bridge. Dickenson Co.,VA. 17 July.
60. Bearpen Branch at Isom off Co. Hwy 620. Dickenson Co., VA. 17 July.
61. Pound River 1 km SW Isom off Co. Hwy 631. Dickenson Co., VA. 6 September.
62. Georges Fork 3 km NW Clintwood off Co. Hwy 621. Dickenson Co., VA. 1 October.
63. Pine Creek 5 km NW Clintwood along unmarked road off Co. Hwy 631. Dickenson Co., VA. 1 October.
64. Pound River at Norland off Co. Hwy 624 bridge. Dickenson Co., VA. 8 November.
65. Pound River 5 km NE Pound at Co. Hwy 666 bridge. Wise Co., VA. 6 September.
66. Bearpen Creek 5 km NE Pound at Hwy Co. 666 bridge. Wise Co., VA. 6 September.
67. Bad Creek 2 km N Pound off Co. Hwy 630. Wise Co., VA. 8 November.
68. Pound River 2 km W Pound at Water Plant Rd. bridge. Wise Co., VA. 6 September.
69. South Fork Pound River 2 km SW Pound at Co. Hwy 671 bridge. Wise Co., VA. 8 November.
70. Pound River 3 km S Pound at Co. Hwy 689 bridge. Wise Co., VA. 8 November.
71. Cranes Nest River 3.5 km NW Fremont along unmarked gravel road off VA Hwy 83. Dickenson Co., VA. 3 October.
72. Cranes Nest River 4 km SE Clintwood at VA Hwy 83 bridge. Dickenson Co., VA. 6 September.
73*. Unnamed tributary to Cranes Nest River 3 km S Clintwood off Co. Hwy 649. Dickenson Co., VA.
74*. Keel Branch 4 km S Clintwood off Co. Hwy 649. Dickenson Co., VA.
75. Rush Creek 4 km W Fremont off Co. Hwy 649. Dickenson Co., VA. 17 July.
76. Cranes Nest River 2 km E Darwin at Co. Hwy 637 bridge. Dickenson Co., VA. 6 September.
77. Dotson Creek 3 km N Duncan Gap off Co. Hwy 634. Wise Co., VA. 8 November.
78*. Unnamed tributary to Birchfield Creek 7 km S Pound off Co. Hwy 673. Wise Co., VA.
79*. Dotson Creek 3.5 km W Duncan Gap off Co. Hwy 636. Wise Co., VA.
80. Cranes Nest River 5 km S Darwin at VA Hwy 72 bridge. Dickenson Co., VA. 8 November.
81. McClure River 3 km W Haysi off VA Hwy 83. Dickenson Co., VA. 15 May, 5 September.
82. McClure River 1.5 km SW Clinchco off VA Hwy 83. Dickenson Co., VA. 3 October.
83. McClure River at Fremont off VA Hwy 83 bridge. Dickenson Co., VA. 7 November.
84. Big Branch 2 km SE Fremont off Co. Hwy 661. Dickenson Co., VA. 17 July.
85. Caney Creek 1 km SW McClure off Co. Hwy 773. Dickenson Co., VA. 7 May.
86. Caney Creek 6 km W Nora at Hwy Co. 644 bridge. Dickenson Co., VA. 7 November.
87. Open Fork McClure River 2 km SW Nora off Co. Hwy 652. Dickenson Co., VA. 7 May.
88. Middle Fork McClure River 3 km S Nora off Co. Hwy 651 at railroad crossing. Dickenson Co., VA. 26 July.
89. Middle Fork McClure River 5 km S Nora along unmarked road off Co. Hwy 651. Dickenson Co., VA. 7 November.
90. McClure River 2 km SE Nora off VA Hwy 63. Dickenson Co., VA. 26 July.
91. Roaring Fork McClure River 2 km SE Wakenva off Co. Hwy 656. Dickenson Co., VA. 26 July, 7 November.
92. Roaring Fork McClure River 4 km E Wakenva off Co. Hwy 656. Dickenson Co., VA. 7 November.

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* = site reconnoitered only
[1] = boat shocking site
[2] = trammel net site
[3] = snorkel survey site

MINUTES

Business Meeting
25th Annual Meeting
Southeastern Fishes Council

The 1999 meeting of the Southeastern Fishes Council was called to order at 4:30 PM on 15 April 1999. The meeting was held in Room C of the Coast Line Center in Wilmington, North Carolina in conjunction with the Association of Southeastern Biologists (ASB). Executive Committee members attending were Melvin L. Warren, Jr. (Chair), Gerald R. Dinkins (Secretary) and Stephen T. Ross (Chair-elect). Mary C. Freeman (Treasurer) was unable to attend. In his opening remarks, Mel noted it was the 25th anniversary of the SFC.

SECRETARY'S REPORT

Meeting attendees were reminded that minutes from the 1998 SFC meeting were published in the most recent issue of *Proceedings* (No. 38) and, in the interest of time, would not be read at that time. After a few minutes during which the attendees were allowed to review the minutes from last year's meeting, a motion was made to accept the minutes as published. The motion carried by voice vote.

TREASURER'S REPORT

Mary Freeman sent her regrets for being unable to attend. Chairman Warren produced a copy of the Treasurer's report, but did not read it since it was published in Issue No. 38 of *Proceedings*. Mel asked that if anyone had questions or changes to contact him or Mary.

COMMITTEE REPORTS

Proceedings Committee

The following items were discussed relative to the *Proceedings* Committee:

1. *Proceedings* Committee is made up of the following members: Steve Walsh, Mary Freeman, and George Sedberry. Steve Stevenson, editor of *Proceedings*, is recovering from triple by-pass surgery, and should be back at work in a few weeks. Mel asked that he be contacted by anyone wishing to serve as editor.
2. SFC by-laws approved at last SFC meeting were published in Issue No. 38 of *Proceedings*.
3. The *Proceedings* Committee is still in the process of recruiting three subject review editors to serve four-year terms plus the remainder of 1998. The *Proceedings* Committee will report their nominations for subject review editors to the Chair. The Chair will consult with Chair-elect in appointing the editors.
4. By-law changes to the SFC constitution approved at the 1998 meeting were published in Issue No. 38 of the *Proceedings*.

Resolutions Committee

The Chair of Resolutions Committee, Peggy Shute, was unable to attend the meeting. Acting on her behalf, Mel outlined resolutions currently being considered by committee, and asked for an update from members closely associated with their progress.

1. Rodman Dam removal: A letter has been sent to Florida governor Jeb Bush and Department of Environmental Protection Secretary David Struhs regarding restoration of the Ocklawaha River. No other information is available.
2. Southeast Appalachian Forest Coalition: No update available.
3. DuPont titanium mining: Steve Walsh reported that SFC's resolution has been sent stating SFC opposition to the proposed titanium mine on land adjacent to the Okefenokee Swamp. DuPont has agreed to not open the mine, but wants compensation for lost mining rights. There is an effort to get money allocated for purchase of the proposed mine site so it can be added to the Okefenokee Swamp National Wildlife Refuge. DuPont has agreed to the resolution.

American Society of Ichthyologists and Herpetologists - Environmental Quality Committee

Chairman Warren recognized Steve Walsh as SFC's ASIH Environmental Quality Committee representative. Steve had little to report because of his recent appointment to the EQC. The most relevant new of interest to SFC was an ASIH resolution sent to the U.S. Fish and Wildlife Service expressing concern over proposed downlisting of the endangered Okaloosa darter.

American Fisheries Society Endangered Species Committee

Chairman Warren recognized Malcolm Pierson as SFC's representative for the AFS Endangered Species committee, and reported that Malcolm was unable to attend this year's SFC meeting. Mel sent word that the chair of the AFS ESC, Leslie Tewinkle, has arranged for Malcolm to provide comments on some decidedly southeastern issues. Malcolm reviewed two federal register notices and provided comments to the AFS ESC on listing notices for the vermilion darter (*Etheostoma chermocki*) and the Alabama sturgeon (*Scaphyrhinchus suttkusi*). He also reported that further reviews of this kind will be forthcoming.

Technical Advisory Committee

The co-chairs of this committee are Mel Warren and Brooks Burr. Brooks was unable to attend the meeting. Mel reported the committee has reviewed the draft of "Diversity, distribution, and conservation status of the native freshwater fishes of the southern United States" as to distributions and assigned conservation status to all taxa. Mel recognized and thanked Bob Jenkins, Noel Burkhead, and Carter Gilbert as the committee's internal reviewers. Mel also thanked Pam Fuller, Leo Nico, and

Jim Williams for graciously allowing pre-publication access to their non-indigenous fishes book so that information can be cross-checked with the SFC list. Mel will send the final draft out to the Technical Advisory Committee one more time. The final draft will then be sent to several internal SFC reviewers and finally to the editor's of Fisheries. Mel reported that he has acquired adequate funding for the color plates and reprints and, hopefully, by this time next year it will be published. Funding has been provided by the Nashville office of U.S. Fish and Wildlife Service, USGS Florida Caribbean Science Center in Gainesville, the U.S. Forest Service, and the Southern Research Center. In March of 1999, Mel presented a summary of the conservation status of southeastern fishes at the World Wildlife Conference in Chattanooga.

ELECTION OF NEW OFFICERS

Chair-elect Steve Ross headed the nominations committee. Nominees for each office were announced, as follows:

Chair elect - Mary Freeman and Wayne Starnes
Treasurer - Peggy Shute
Managing editor - Frank Pezold
Secretary - Gerry Dinkins (incumbent)
Associate editor - George Sedberry (incumbent)

The floor was opened for nominations, and none were given. After accepting a motion to close the floor for further nominations, a voice vote was held to elect officers running unopposed. Peggy Shute, Frank Pezold, Gerry Dinkins, and George Sedberry were elected to their respective offices. Blank pieces of paper were distributed by Steve Ross for the attendees to vote for Chair-elect.

OLD BUSINESS

Dave Etnier asked if SFC had responded to U.S. Fish and Wildlife Service's listing of Alabama sturgeon. Chairman Warren replied that SFC did not officially respond. Hank Bart stated that comment period closes on May 26. Chairman Warren charged the resolutions committee to draft a letter supporting the listing of vermilion darter and Alabama sturgeon.

NEW BUSINESS

Chairman Warren discussed the status of SFC's southeastern imperiled fishes initiative, and gave October 26 - 28 as the dates for meeting of a Southeastern Imperiled Fishes Working Group, to be held in Chattanooga. Tentative plans are to invite three people from each state, of which two would be state agency biologists, and the third would be someone from academia knowledgeable about local fish species. Additionally, individuals selected from federal agencies would be invited. Mel urged attendees with expertise in non-game fish identification and biology to contact their state agencies to offer assistance.

Gerry Dinkins stated that a representative from the Tennessee Department of Environment and Conservation had approached him regarding applications for altering springs and headwater streams. TDEC feels that often there is insufficient information in their database on distribution and status of sensitive headwater fish species. Input from SFC could be very useful in the application review process. Chairman Warren asked for and received a motion to have Gerry Dinkins work with the Executive Committee and draft a letter to TDEC regarding SFC's desire to be informed of and provide comments on applications for spring and headwater impacts. Hank Bart said a similar situation exists in Louisiana and he would contact the appropriate state agency.

On behalf of a request by Peggy Shute, Chairman Warren asked for input regarding a process by which agencies and/or individuals could be recognized for their efforts to preserve and protect out native fishes. After a brief discussion, Mel asked the resolutions committee to compile a list of nominees and send it to Executive Committee for review.

Steve Ross announced that the votes had been tallied and Mary Freeman is the new Chair-elect.

Chairman Warren noted that Steve Stevenson has been Editor of *Proceedings* for an extended period. Mel asked for and received a motion to send Steve a letter recognizing his many years of service.

Steve Layman announced the Corps of Engineers has prepared Draft Environmental Impact Statements for the compacts between the states of Alabama, Georgia, and Florida on negotiating water allocation for the Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) River basins. The Draft EISs were issued by the Corps for each basin in September 1998. December 31, 1999 is the deadline for the states to reach agreement on the allocations, with Final EISs to follow. Steve spoke of the schedule for the programmatic EIS project and the range of alternatives evaluated in the DEIS. Steve wants SFC to be aware the EIS is coming.

Chairman Warren opened the floor for discussion of moving the annual meeting venue of SFC from its traditional arrangement with ASB to the annual midyear meeting of the Southeastern Division of the American Fisheries Society (SDAFS). Steve Walsh provided some information on the origin of SDAFS and gave a historical overview. Chairman Warren asked for a motion that we approach AFS relative to meeting with their southern division. Mel also asked for a motion on drafting a list, which would be mailed to the membership, of pros and cons relative to changing the SFC venue. If changing the venue met the approval of the governing board of SDAFS and the SFC Executive Committee, the entire SFC membership will be allowed to vote by mail-in ballot on a possible change in venue. The vote of the membership will be used to guide the action of the Executive Committee.

Both motions made and unanimously passed. Dave Etnier asked that we discuss this potential move with our herpetology colleagues before moving forward.

Chairman Warren announced this was the 25th Anniversary of the founding of SFC, and recognized attendees Bruce Bauer, Dave Etnier, and Herb Boschung as charter members. Recognition was also given Mark Sabaj, illustrator of this year's fish button depicting *Percina tanasi*, the snail darter, and to Hank Bart for his efforts putting together the anniversary fish button.

REGIONAL REPORT

Regional reports were not presented. Attendees were referred to the most recent issue in *Proceedings* where the regional reports have been published.

After accepting a motion to adjourn, Chairman Warren closed the meeting at 5:35 PM.

Respectfully submitted,
Gerald R. Dinkins, Secretary

Southeastern Fishes Council Treasurer's Report, April 1999

Checking Account Balance, 8 April 1998		$1,985.03
Dues and Contributions, 8 April 1998 through 12 April 1999:		
Past dues	$60.00	
1998 dues	$1940.00	
1999 dues	$840.00	
2000 dues	40.00	
Proceeds from Button sales	$252.00	
Contributions	$50.00	
Reprint sales	$47.40	
TOTAL:		$3,229.70
Expenditures, 8 April 1998 through 12 April 1999:		
Proceedings 37, printing cost	$823.62	
Proceedings 37 postage	$161.60	
TN Secretary of State (annual report)	$20.00	
1998-edition Buttons, production cost	$25.45	
Proceedings 38, printing cost	$1,028.71	
Proceedings 38, postage	$177.87	
TOTAL:		$2,237.25
Checking Account Balance as of 12 April 1999:		$2,977.48
1999 dues received, not yet deposited		$200.00
Paine Webber Cash Fund as of 31 December 1998:		$2,929.45
Reported Fund, 31 December 1997	$2,786.10	
Earned interest and adjustments, 1998	$143.35	
Total Assets		$6,106.93

Notes:
Paid membership through 1998 stands at 130 individuals and institutions. Members as of 1997 who did not renew in 1998 = 16.

Regional SFC Reports

REGION I - Northeast

Bob Jenkins (Roanoke College) is still a sucker, oops, still studying suckers. In summer 1999 he finished major report to USFWS on description, life history, spawning behavior, habitat, distribution and population status of the undescribed sicklefin redhorse. A major survey for this species will occur in March 2000 (with Bob involved) relative to re-licensing dams that are in, or blocking the range of, the sicklefin in the Hiwassee and Little Tennessee systems. A Redhorse sucker spawning-behavior study, with Mark Clements and Bud Freeman, has year 2000 as its fourth and final year of observations. Meanwhile, analysis of about 40 h of videotape continues. Excerpts can be viewed on the Playboy Channel. A major feature is seeing *Moxostoma carinatum* and *M. erythrurum* spawning as interspecies trios, in varied combinations of species' positions (right, left of female), and species of the female. Interspecies acts were observed in S. Fk. Holston River, VA, Valley River, NC, and Brasstown Creek, GA. Folks better be pulling more pharyngeal arches.....

Mike Pinder (Virginia Game and Inland Fisheries) completed a survey for *Enneacanthus chaetodon*, a state endangered species in VA. It was found at eight sites in the Blackwater and Nottoway systems, three of which represent new populations. His department is funding Paul Angermeir (VPI) in a study of *Percina rex* and habitat use. Depending on funding success, he hopes to fund a genetic study of the spotted form of *Noturus insignis* and a basin-wide survey for *Etheostoma osburni*.

Gene Maurakis (Science Museum of Virginia) has teamed up with Ray Katula and Bill Roston to describe breeding behaviors in *Hemitremia flammea* from field and laboratory studies. A publication is in review on comparisons of spawning and non-spawning substrates in nests of species of *Exoglossum* and *Nocomis*. Gene will be wrapping up field studies on attraction of nest associates to nests of pebble nest-building fishes in spring 2000. Gene and Dave Grimes (VA DEQ) have completed Phase I studies on methodology development for use of wedge clam (*Rangia cuneata*) in biomonitoring studies.

The North Carolina State Museum is, for the most part, consumed in efforts to get the main museum open on 7 April 2000. It will be the largest natural history museum in the South; y'all come. Another major effort has been to finalize the data base structure for computerization of all natural history collections, including fishes. With the combined holdings comprising the core NCSM collection and those of Duke University, UNC Institute of Marine Science, NCSU, the Wildlife Commission surveys, Wayne Starnes' personal collection, and several other sizeable acquisitions, this data base is anticipated to contain data on between 80,000 and 100,000 lots. The data structure is Access-based and employs the basic structure acquired from the Florida State Museum, with several modifications to accommodate NCSM's needs. One feature being added is a large database, compiled by Wayne Starnes, Art Bogan, and Wendy Gotch, containing a hierarchical tabulation

of drainage basins for much of North America. It includes all of the United States and much of Canada, and a framework for the remainder of Canada plus Mexico, with plans to expand beyond as needed. This table, linked to the catalog database to have an oversight function, facilitates standardized entry and retrieval of drainage information in hierarchical fashion down to seven levels. It presently contains over four thousand records. Also linked to the database is a taxonomic and spell-check table based on the long, long in-press USGS checklist of vertebrates, with a fish list authored by Wayne Starnes. Goals are to have substantial portions of the database available on the NCSM web site in 3-4 years. The collections and backlog holdings are now well organized and stabilized in the new Research and Collections Facility to which they were moved in 1998.

Morgan Raley, who recently completed a Ph.D. with Rob Wood at St. Louis University, has joined Gabriela Hogue (erstwhile Mottesi, married off since last report) and Lynn Fullbright on the fish heads staff at NCSM for the time being. He and Rob's molecular treatment of *Crystallaria* recently appeared in Copeia and his dissertation topic, a phylogenetic analysis of the *Notropis dorsalis* group, is not far behind. Lynn is revisiting the *Etheostoma nigrum-olmstedi* problem in the Tar and Neuse systems as a master's thesis topic at NCSU where she is enrolled in graduate school. Gabriela and Wayne can only wish at this time that they could return to some research, though Wayne gets in a few late night efforts at completing an historical analysis and IBI study of lower Potomac fishes yet remaining from his Smithsonian days and a few efforts with Bob Jenkins on the undescribed "Carolina redhorse". West Pacific and West Atlantic priacanthid manuscripts for FAO are in press and methods for non-lethal tissue sampling in endangered fishes (*Gila*) recently appeared in *North American Journal of Fisheries Management*. Gabriela hopes to embark on studies of the biology of *Chologaster* soon and publish her master's thesis on unionid mussel glochidia and fish hosts. Spurred mainly by needs for exhibits, Wayne Starnes, Dick Bryant, et al. collected and obtained excellent photographs of a substantial portion of North Carolina fish species in 1999. Finally, it appears that IBIs and other studies have drawn agency, public utility, and similar sorts of biologists more and more back into the world of little nongame fishes. It has created a need and desire for instruction on identification of same in those circles. The NCSM contingent was requested to provide large workshop on identification of regional minnows, suckers, and darters at the NC AFS conference and did so, with a healthy attendance of 43 members. Such efforts are looked upon as an opportunity to build mutually beneficial alliances between taxonomists and fisheries scientists, as well as benefit the resource we treasure, southeastern fishes.

Fritz Rohde (NC Marine Fisheries), Rudy Arndt (Richard Stockton College) and Jeff Foltz (Clemson University) are still plodding away on their studies of South Carolina's freshwater fishes. Rohde is working with Joe Quattro (University of South Carolina) and students on various studies of the genetics of southeastern fishes, primarily *Elassoma, Noturus, Fundulus*, and *Hybopsis/Cyprinella*.

Jan Hoover reports that the Waterways Experiment Station Fish Team, part of the U.S. Engineer Research and Development Center at Vicksburg, MS consists of seven individuals: Jack Killgore, Jan Hoover, Phil Kirk, Steven George, and Bradley Lewis. They are assisted by Neil Douglas and William Lancaster (a commercial fisherman). Ongoing projects include a grass carp population study in the Santee-Cooper River system. Fish are collected by bow fishermen and otoliths extracted. Age and growth data are collected and used to develop population models that estimate mortality and stocking requirements to control aquatic vegetation in Lake Marion, SC. Streams in Fort Gordon, GA were sampled were invertebrates and fishes to identify nursery and feeding grounds. Noteworthy was the discovery of several populations of *Elassoma okatie*. In a previous study (18 stations sampled quarterly), the bluebarred pygmy sunfish was documented only at a single location in Boggy Gut Creek. In the current study, it was observed at several locations and is now documented from four of the five principal streams on the army installation. Habitat models are being developed for this and other aquatic species. Finally, the Ogeeche River of Fort Stewart, GA was sampled last year for shortnose sturgeon. Fish are being tagged and fin clips taken for ageing. Mark and recapture data and age and growth data will be used to create population models, assess populations status, and develop management protocols.

Fritz Rohde

REGION II - Southeast

Conservation Notes

Paraphrasing a "*Tale of Two Cities*," the future conservation status of southeastern fishes teeters between: "the worst of times, the less worst of times." Looming before us are perhaps the most serious threats to southeastern fishes and stream habitats. Yet, seemingly poised to counteract at least some of effects of population growth is a remarkable document: "Strategy for the Conservation and Recovery of Southeastern Imperiled Fishes." The final version will be available by the publication time of this issue. This document, a true consensus strategy, is the product of an October 1999 workshop in Chattanooga among 11 southeastern states and eight federal agencies. Even more remarkable is the likely availability of funding (billions of dollars) through the Conservation and Reinvestment Act (CARA), which seems certain to pass both houses and be signed by President Clinton. Without the consensus document and funding, the future of many southeastern fishes and habitats would be bleak. These are discussed in detail.

1. Tri-State Water Project: Perhaps the apocalyptic predictions of the new millennium were true. Instead of famine and pestilence, instead of bizarre collection permit requirements, instead of data mongers, lapping at the door is water wars–eastern style. This project centers around the future water needs of three states, Alabama, Florida, and Georgia, specifically involving interbasin transfer between the Apalachicola, Chattahoochee, and Flint rivers (ACF,) and the Alabama, Coosa, and Tallapoosa rivers (ACT). Of the three states, Georgia has

the most to gain relative to long-term water supply for Atlanta. The multiple agencies involved in the project are unable to agree on how much water should be withdrawn from what, to where, and when (allocation formulas). There also is no consensus on potential deleterious biological effects, and on where and when to conduct monitoring. A federal mediator may have to intervene and make decisions for all parties involved if no consensus is reached. From all non-Atlanta positions, the project appears to be a no-win situation. In fairness, the federal mediator seems cognizant of environmental concerns. However, given the hackneyed call-to-arms, "it's either the economy or the environment" (read my lips), well, we know who wins. A copy of the most recent draft agreement may be obtained from: Heather Hallows, Assistant to the Federal Commissioner, ACT/ACF River Basin Commissions, Atlanta office phone (404) 223-2264x307; Ft. Benning office phone (706) 689-2254, cell phone (706) 575-8435.

Whatever agreement is finally reached, it will set an uneasy precedent. Interbasin transfers will likely become a reoccurring theme as southeastern metropolises grow beyond their immediate carrying capacity and vie for neighboring resources. This phenomena is happening across the South. For example, Tampa, Florida, is hunting for additional sources of freshwater and has floated a proposition to pipe water south from the Suwannee River. To date, this proposal has been successfully opposed. Because coastal cities are rapidly expanding, urban planners will increasingly look to inland freshwater sources for future supply. Engineers will undoubtedly view every drop above the 7Q10 in flowing rivers as "excess water." For inland cities, off-river or headwater water-supply impoundments are the current cure for water shortages. Atlanta plans to encircle itself with a ring of such impoundments. Besides fragmenting rivers, these small impoundments could impact headwater species with limited ranges. In the case of Atlanta, small adjacent towns such as Canton are under pressure to plan their own off-river impoundments. The adjacent large-small city pattern could result in a cascade of river fragmentation and direct habitat loss for listed or imperiled fishes.

2. *The 100-year Southeastern Timber Stand:* Another large-scale, serious threat to fishes and habitats is the tremendous economic attractiveness of the hundred-year stand of southeastern forests. Eighty-nine percent of southeastern forests are in private ownership (20% owned by timber companies; 69% by individuals and non-timber companies). Only 11% of forests are on federal lands (6% national forests; 7% other federal ownership). Projected harvest rates predict logging in Tennessee alone will increase by 100% in the next decade. Although logging on private lands is supposed to follow established Best Management Practices, apparently that rarely happens. In fact, timber rustling (surreptitious logging of somebody else's land), is becoming more common due to the big bucks for lumber-grade timber, especially hardwoods. With so little southeastern forest land owned by the USDA National Forest Service, it does not seem very prudent to harvest timber from these lands.

Massive logging across the southeast is very likely in the next two decades. The size of the operations will range from immense chip mills to individual operations. Proposals to develop several large chip mill plants in Tennessee and north Alabama were recently denied, but it is just a matter of time before permits are given. We know logging the last 100-year stand in the southeast caused tremendous erosional problems in creeks and rivers, but at that time there was no such thing as Best Management Practices. The ensuing erosion was tremendous, particularly in the upper Piedmont where soils are generally very erodible (actually, channelization was, in part, a "solution" to the "sediment" problem). While modern operations do not use splash dams or cut down every tree, the sheer scope of operations and rate of timber removal will create tremendous stressors on fishes and habitats.

Given the array of threats that are reasonably anticipated, levels of imperilment in southeastern fishes will significantly increase without significant efforts to recover habitats and establish connected river refugia. The cumulative effects of human population growth may push many southeastern fishes to levels of imperilment currently experienced by freshwater mussels. Southeastern fishes have endured previous episodes of persistence-threatening, large scale events (e.g.,pervasive water pollution prior to the Clean Water Act, era of high dam construction). It is remarkable that some species have even persisted this long. However, the rate, magnitude, and permanence of change across the southeastern landscape has never been greater: more change will occur in the next two decades than during the entire history of European colonization. That unprecedented level of pervasive stressors will undoubtedly force marginally persisting fishes closer to extinction.

The good news is there is the chance for an equally unprecedented level of conservation work on southeastern fishes and habitats. In October 1999, the U.S. Fish and Wildlife Service brought together three representatives from 11 southeastern states (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia), representatives from eight federal agencies (Army Corps of Engineers, Environmental Protection Agency, U.S. Fish and Wildlife Service, Federal Energy Regulatory Commission, U.S. Forest Service, Natural Resource Conservation Service (formerly Soil Conservation Service), U.S. Geological Survey, and the Tennessee Valley Authority), and representatives from academia. The goal of the three-day facilitated workshop was to produce a consensus agreement on what actions were needed to address, slow, abate, and correct the increasing levels of imperilment in southeastern freshwater fishes. For the 60+ participants, the workshop was a wringing, exhaustive experience. The document resulting from the workshop, "Strategy for the Conservation and Recovery of Southeastern Imperiled Fishes" by Dick Biggins and Vince Mudrak, is in the third draft at this writing. This document was modeled after the strategic plan for the recovery of mussels, which already has fostered a significant increase in the conservation research and stream restoration work

I believe this document may be the single most important effort to date towards the conservation and restoration of southeastern imperiled fishes. Researchers from academia and governments will be able to use the document to support need and justification of proposed work on southeastern imperiled fishes. No longer will protection of brook trout habitat be the

primary objective in studies of upland, nongame fishes. While many have talked and written about the cooperation needed to effect change in patterns of decline, this document is an example of, and a vehicle for cooperative efforts. As bleak as the potential future is for imperiled southeastern fishes, this document offers a mechanism to begin counteracting the forces of degradation.

The strategic plan also has the support of conservation organizations, the Tennessee Aquarium, and the National Fish and Wildlife Foundation. While the strategic plan alone is just another unfunded federal mandate, serendipity strikes: the Conservation and Reinvestment Act (CARA, H.R. 701), a bipartisan bill with strong support, may literally bring billions of new dollars to states for a variety of conservation and environmental projects. In my opinion, this is a bona fide miracle! Areas and levels of funding that could benefit southeastern freshwater fishes are: 1) Impact Assistance and Coastal Conservation - $1 billion; 2) Wildlife Conservation and Restoration Fund - $350 million; 3) Conservation Easements and Species Recovery - $150 million. This act is supported by diverse, multiple groups who recognize the economic importance of viable natural resources. Some of these groups are: U.S. Conference of Mayors, International Association of Fish and Wildlife Agencies, The Wildlife Society, Americans for Our Heritage and Recreation, The Wilderness Society, National Wildlife Federation, Sporting Goods Manufacturers Association, National Recreation and Park Association, Izaak Walton League of America, Outdoor Recreation Coalition of America, The National Wild Turkey Foundation, Rocky Mountain Elk Foundation, Wildlife Management Institute, Association for Biodiversity Information, Bass Anglers Sportsman Society, and many more.

Research Notes

Georgia: Steve Vives (Georgia Southern University), and his student William Tate are looking at the effect of pH on habitat choice in sunfishes. A new student, Joel Fleming, is interested in the study of movements by shortnose sturgeon. This work is sponsored by Ft. Stewart Military Reservation.

The folks from the Army Corps of Engineers Waterways Experimental Station, Vicksburg - Jan Hoover (JJH), Jack Killgore (KJK), Jan Hoover, Phil Kirk (JPK), Steven George (SGG), and Bradley Lewis (BRL) - are working on multiple projects in the southeast. In addition, the ardent collector, Neil Douglas (NHD), Professor Emeritus, University of Louisiana (Monroe) and William Lancaster (WEL), a commercial fisherman, are working on some of the projects. Distilled from the 17-page list sent by Jan are notes on the following projects. Savannah River Drainage - Faunal survey of streams on military lands (JJH, KJK, SGG, BRL, NHD)- Streams in Fort Gordon (Georgia) were sampled for invertebrates and fishes to identify nursery and feeding grounds. Noteworthy was the discovery of several populations of bluebarred pygmy sunfish (*Elassoma okatie*). In a previous study (18 stations sampled quarterly), the bluebarred pygmy sunfish was documented only at a single location at one stream: Boggy Gut Creek. In this study, it was observed at several locations and is now documented from four of the five principal streams on the army installation. Habitat models are being developed for this and other aquatic species. Ogeeche River System - Shortnose sturgeon study (JPK) - The portion of the Ogeeche River in Fort Stewart (Georgia) was sampled last year for shortnose sturgeon. Fish are being tagged (externally and with PIT tags) and fin clips are taken for aging. Mark/recapture and age/growth data will be used to create population models, assess population status, and develop management protocols.

Three of four symposia, conferences, or workshops on stream restoration and conservation of southeastern imperiled aquatic species have occurred, and the fourth (EEEF, see below) will be held in May, all within one year. A conference on "Stream Restoration and Protection was held in Asheville, NC on 17-20 August 1999. Like so many workshops, biologists, hydrologists, and urban planners were in different concurrent sessions. At the conference I heard new terms: "training"or "re-training" streams. Immediately one thinks, "Bad creek, how many times have I told you not to jump your banks?" Seriously, consulting firms see restoration as the next economic bandwagon, but what they view as restoration is a different concept than that of most aquatic ecologists.

The Southern Division of the American Fisheries Society and the Southeastern Fishes Council had a joint meeting in Savannah on 3-6 February 2000. The SDAFS/SFC Symposium on "Conservation of Freshwater Nongame Aquatic Fauna in the Southeast - Challenges for a New Millennium", was the most-attended symposium or session at the meeting. SFC members were the majority of speakers. Peggy Shute, (TVA) winner of the first ASIH Carter Gilbert Decorum award, retook her claim to the award barely one minute into her talk.

A symposium, hosted by Gene Helfman (University of Georgia) and Steve Vives, entitled "Ethology, Evolutionary Ecology, and Conservation of Fishes (EEEF?) will be held at the University of Georgia, Athens during 20-24 May 2000. DarterFest will be held in conjunction with the symposium on 24-25 May. For further information, see the meeting website: http://sparc.ecology.uga.edu/~helfman/eeef.html.
Mark Scott, a Ph.D. student working with Gene, plans to conduct a study of (as part of the Coweeta LTER site) the relation of stream physical and chemical habitats, and an analysis of spatial and temporal scale influences of landscape use on fish assemblages in 36 sub-basins in the upper Tennessee drainage of western NC.

Bud Freeman (also UGA) is his usual frenzied self, simultaneously handling multiple Section Six contracts on listed fishes, while being an active member of Robust Redhorse recovery team. Bud is one of the authors contributing to the comprehensive list and conservation status of southern fishes, an effort led by Mel Warren (USDA Forest Service Hydrology Research Laboratory, Oxford, Mississippi) and other SFC members. The list probably will be published in a forthcoming issue of *Fisheries*. Also, Bud is part of the Jenkinsonian redhorse saga, now spanning decades, and only two decades to go before eclipsing the pre-publication wait for the *Fishes of Virginia*. Mary Freeman (Patuxent Wildlife Research Center, Athens Laboratory) has been active in the study of the effects of regulated river reaches on fish community persistence and composition. Some of Mary's work suggest that the general

philosophy of mediating for the highest possible discharges (as run-of-river flows) from high dams may not be the best long term approach. She has interesting data showing the "little fishes" benefit from periods of low flow, possibly due to increased spawning success. Mary has been plugging away at the Halloween Darter description; this spring I will assist Mary in photographing the cryptic darter. Mary and Bud were participants in the aforementioned U.S. Fish and Wildlife Workshop on imperiled fishes. Dean Fletcher (Savannah River Ecological Laboratory) published several interesting contributions to the life history of *Pteronotropis hypselopterus* (with David Wilins and *P. welaka* in Copeia (1999 Number 2).

Florida: I'll state it right out front: Jim Williams (USGS Florida Caribbean Science Center) out-published everybody in the state. The single fish paper of significance (with George Burgess, Florida Museum of Natural History), is the description the shoal bass *Micropterus cataractae*, a fish so well-known that it may not have needed formal description (long known common name and binomen). In fact, the shoal bass has been known since Carl Hubb's time and would have been described by Rafinesque, had he visited the area. Jim also published a name correction for the pygmy sculpin, *Cottus palus* (seems *pygmaeus* was occupied by a Russian sculpin). Additionally, Jim published several clam papers, which I correctly noted would be of little interest to SFC members.

Other ichthyologists at the FCSC did not fair as well as Jim (except Bill Smith-Vaniz, who published a book on Bermuda fishes, but that doesn't count because it covers marine species). Steve Walsh and I will try to complete the ms on patterns of imperilment in southern Appalachian fishes this year, and Howard Jelks and I have completed revision of a manuscript examining the effects of suspended sediment on the reproductive success of the Tricolor Shiner *Cyprinella trichroistia*. Steve Walsh is also one of the authors on the Warren et al. manuscript on the conservation status of southern fishes. Steve is the liaison between the FCSC and the Mobile River National Water Quality Assessment (NAWQA) study (Montgomery, AL office of USGS Water Resources Division). Leo Nico and Jeff Herod are working on several aspects of nonindigenous fish biology in South Florida (community interactions, age and growth, and dietary studies). The Asian swamp eel (*Monopterus albus*) has caught the public's attention, most recently by *Life* magazine. Howard Jelks and Frank Jordan (Loyola University, New Orleans) are in the sixth year of monitoring the endangered Okaloosa darter on Eglin Air Force Base, western Florida. Howard and Frank are reviewing the first five years of data to determine if any changes are needed in the protocol. Howard and I are also working on a handbook of the fishes of Eglin Air Force Base. Each of the 63 species found on the base will have a species account with a color picture, a dot distribution map, and biological information. Howard, Steve Walsh, and myself are funded to examine the spread of the introduced red shiner (*Cyprinella lutrensis*) in the upper Coosa River system, Georgia. If the red shiner is spreading, we plan to conduct experiments examining the reproductive interactions between the threatened blues shiner (*C. caerulea*) and the red shiner. Pam Fuller indicated that the Nonindigenous Database for fishes now has 17,000+ records. Please contact Pam (352.378.8181, ex312; pam_fuller@usgs.gov) if you have any records of nonindigenous fishes from your areas of study. The database is at the center's website:
http://nas.er.usgs.gov/fishes/fishes.htm.

Carter Gilbert, University of Florida (ret.) emeritus professor, who shies away from me for some reason, admitted he was only retired in stature, not in activity. Work on the *Macrhybopsis aestivalis* complex continues as is the gestating Florida fishes book. Indeed, I've observed Carter at our lab visiting Jim Williams more times this year than all previous years of my tenure. Perhaps he is learning clams or is subconsciously drawn by some sort of glabrous cephalic synapomorphy. Gray Bass, Florida Department of Conservation, is nearing completion of a fishes of Florida book that will be oriented towards anglers and amateur naturalists. Steve Bortone, now at Florida Center for Environmental Studies, Ft. Myers, is working on the life history of *Pteronotropis signipinnis* and *P. welaka*. Steve received funding from the nongame program of the Florida Department of Conservation to conduct this work.

If you wish to have your conservation or research activities for Region II published in a future issue, please contact me (noel_burkhead@usgs.gov).

Noel Burkhead

REGION III - North-Central

Status surveys and other interesting finds

Ed Scott (TVA) reported that snail darter (*Percina tanasi*) distribution and abundance continue to improve in the Douglas tailwaters in the lower French Broad River. Adults were found at all sites sampled from French Broad River mile 8 to mile 29.8, almost to Douglas Dam. The tailwater community is also improving in other ways, as tangerine and bluebreast darters (*Percina aurantiaca*, and *Etheostoma camurum*) were collected there for the first time in 1999. In addition, two blue suckers (*Cycleptus elongatus*) were also collected by students at Tennessee Tech, in this stretch of river. Speaking of the French Broad River, Etnier (University of Tennessee) also commented on the continued improvement of the Douglas and Cherokee tailwaters, and reports the collection of wounded darters (*Etheostoma vulneratum*) for the first time in the Little Pigeon River about two miles downstream of Sevierville (Sevier Co., TN).

Etnier also remembered some interesting accidental introductions into the French Broad and Nolichucky rivers in western NC that we forgot to mention in earlier reports (he is getting on in years!). He said "it looks like someone got a truck full of fishes from the Piedmont and dumped them in the French Broad! Charlie (Saylor) thinks they might be getting flushed out of the big pond at the Biltmore estate." These include chain pickerel and flat bullhead (UT 38.180 and 48.966, respectively), French Broad River Miles 145 & 150, Buncombe Co. NC, July 1997; two additional localities for *Ameiurus platcephalus*, Newfound Creek and Swannanoa River, added to 48.966;

Nocomis leptocephalus, from Cane Cr., Mitchell Co. NC, June 1977 (UT 44.8552); *Gambusia holbrooki*, Mud Cr., Henderson Co. NC, April 1997 (UT 61.236); and *Lepomis gibbosus*, French Broad River Mile 150 and Hobson Cr. of Ivy Cr., Buncombe Co. NC, June/July '97 (UT 90.2531). In the Nolichucky system, he noted the following introductions: *Ameiurus platycephalus* from two localities in the Cane River, Yancey Co. (UT 48.981); *Clinostomus f. funduloides*, North Toe River, Yancey Co. (U.T.44.8555).

Ed Scott also reported some interesting finds from the Duck and Buffalo rivers: abundant coppercheek darters and a lone ashy darter (*Etheostoma aquali*, and *E. cinereum*) in Flat Creek, near Shelbyville, Bedford Co., TN; several coppercheek darters in the Normandy Dam tailwaters of the Duck River where only a single individual was collected in 1998; slenderhead darters (*Percina phoxocephala*) also still present in the Duck River at Williamsport (Maury Co., TN); and blotchside logperch (*Percina burtoni*) and ashy darters in the Buffalo River near Flatwoods, TN (Perry Co., TN). Also, although Citico Creek (Monroe Co., TN) seems to have been well studied, Ed also reported the first record of wounded darters (*Etheostoma vulneratum,* UT 91.5566) from upper portions of the stream.

Charlie Saylor (TVA) reported that his crews sampled fish from close to 200 stream sites during the 1999 field season as part of TVA's watershed monitoring program. One of the most interesting finds was the first record of slackwater darter (*Etheostoma boshungi*) in Limestone Creek watershed in Alabama. Charlie also reported that Chris Underwood collected an American eel (*Anguilla rostrata*) in the Nolichucky River in North Carolina, which was probably a bait bucket introduction.

Ramon Martin and Jim Layzer (Tennessee Technological University) reported results of a biotelemetry study of lake sturgeon as part of a multi-agency partnership to reestablish a reproductively viable lake sturgeon population in the lower French Broad River and in the mainstem Tennessee River near Knoxville, Tennessee. In August 1999, they released six radio-tagged (external) lake sturgeon that had been reared at Warm Springs National Fish Hatchery, Warm Springs GA. The externally-tagged fish were detected 9-24 days after release. One internally tagged individual was still detected 159 days after release. Net downstream movement averaged nearly 40 km, and all but one of these fish were known to have migrated out of the French Broad River, and into Fort Loudoun Reservoir.

R. Shute, Pat Rakes, Bo Baxter (CFI) surveyed the Elk River system looking for boulder darters (*Etheostoma wapiti*). They found boulder darters in a few new localities in the mainstem Elk River where appropriate habitat was present, but did not find any new tributary populations. They did rediscover boulder darters in lower Richland Creek. None were found above Harms Mill dam, a significant barrier a few miles below Fayetteville, suggesting they may have been extirpated from the reach of the Elk River upstream of the dam and are unable to recolonize.

Following up on reports that consultants had turned up specimens of an unidentified *Phoxinus* in a tributary to the Clinch River (Tazewell County, VA) in February 1999, Chris Skelton and Steve Holdeman surveyed a Clinch River tributary in Russell County in September 1999. The stream where the *Phoxinus* were originally reported is on coal mine property, and not easily accessible. Live individuals of this dace are in aquaria at CFI. Chris has determined that the fish are either the undescribed "laurel dace" or something very close. He will be looking for breeding individuals in spring 2000.

Chris also followed a tip provided by Steve Fraley, at TVA, that *P. tennesseensis* had been collected in a Powell River tributary in Lee County, VA in 1995 by TVA surveyors. No specimens were retained, so Chris re-visited the site in fall 1999. The species turned out to be *P. cumberlandensis,* which had been previously known only from the Cumberland River drainage. Leroy Koch of the USFWS is trying to organize a status survey for the species in southwestern Virginia.

CFI's surveys of the Little River, Blount County, TN revealed that tangerine darters (*Percina aurantiaca*) are abundant, blotchside logperch and longhead darters (*P. burtoni* and *P. macrocephala*, respectively) are still "relatively common", but ashy darters (*Etheostoma cinereum*) are very rare. Duskytail darters (*E. percnurum*) were found to be still hanging on at the TN Hwy 33 bridge and a single individual, the first seen in over a decade, was observed upstream at the U.S. 411 bridge. Additional surveys will be conducted to determine this species' status in the nearly 10-mile reach between the two sites (lack of access requires fishing, oops!, floating).

Bernie Kuhajda (University of Alabama) reported that he and Kevin Roe, a new post-doc in Rick Mayden's lab, recently completed a survey for additional populations of the Alabama cavefish (*Speoplatyrhinus poulsoni*) in caves along the Tennessee River in northern Alabama. Jim Godwin of the Alabama Natural Heritage Program combined some of his surveys of caves for the Tennessee cave salamander with these fish surveys. This survey was inspired by their discovery of southern cavefish (*Typhlichthys subterraneus*) sympatric with Alabama cavefish, as reported last year. They found several populations of southern cavefish, but no *Speoplatyrhinus*. However, they did discover what appears to be a new species of cave shrimp in two caves just west of Tuscumbia.

Scott Mettee, of Geological Survey of Alabama (GSA) reported that his crew is finishing for GSA publication a manuscript on Tennessee River fishes in north Alabama and northeast Mississippi. This report, containing records from 1,188 fish samples collected at 761 stations from 1845 through 1998, will add some interesting new distribution records to Mettee et al. (1996). The TVA/GSA sample team collected the most species ever taken from the TVA Bear Creek site on the Natchez Trace. He also reported that although they didn't get another *Cycleptus elongatus*, the electroboat team, composed of Captain Ed Scott and deck swabber Scott Mettee, did collect several interesting species during the sample, among which were *Carpiodes carpio*, *C. velifer*, and *Percina phoxocephala*. Shoal Creek will be a priority sampling area for the GSA's TVA work in spring 2000.

Lastly, if the "creek don't rise" a host of North American ichthyologists will descend on the lower Duck River to set a record for the most fish species collected in a short river reach in North America. Dates are slated for 3-4 June. Bob Jenkins has volunteered to be the principal contact, just in case you are interested and have been able to thus far avoid the reams of e-mails cluttering cyberspace.

Mussels & other aquatic critters of interest

Dick Neves (Virginia Tech.) reported that the techniques and technology for mussel propagation has been worked out over the last 10 years, funded cooperatively by the States of Tennessee and Virginia, U. S. Fish and Wildlife Service, and Biological Resources Division of the U. S. Geological Survey. The Freshwater Mollusk Conservation Center at Virginia Tech is a prototype facility, with a holding room for adult mussels and host fish research, a room for production of juveniles, an algae culture room, and a greenhouse for rearing of juvenile mussels. Juveniles are usually reared for several weeks before being released to sites approved by TWRA and USFWS. The Buller Fish Hatchery in Marion, VA has recently come on board as a cooperator to provide raceway facilities for grow-out of mussel species state-listed in Virginia.

Of importance to the Southeastern Fishes Council, Neves noted that, after years of host fish identifications for a suite of endangered mussels, it has become evident that darters, minnows, and sculpins are what sustain most of the reproduction of these endangered species. For example, glochidia of riffleshell species (*Epioblasma* spp.) such as the oystermussel and Cumberlandian combshell transform best on banded and black sculpins, and redline darters. Similarly, glochidia of the fanshell transform most successfully on greenside darters and *Percina* spp. (logperch, tangerine darter, blotchside logperch). Other mussel species that spawn only in summer such as pigtoes (*Fusconaia* spp.) tend to use various species of cyprinids almost exclusively. All of their host fish research makes it evident that the world class diversity of freshwater mussels in the Tennessee River system is sustained by the high diversity of the indigenous fish fauna, or what non-biologists and fishers would consider inconsequential, nongame species. Recovery of these federally listed mussels cannot occur without the healthy and diverse assemblage of these fish species. In 1998, Neves' lab produced, cultured, and released roughly 35,000 endangered juveniles of six federally listed mussels, produced from induced infestations of glochidia on host fishes. In 1999, they released nearly 135,000 endangered juveniles of eight species, from literally hundreds of infested host fishes, into the Clinch, Powell, and Hiwassee rivers in eastern Tennessee. They hope to be able to release approximately 100,000 juveniles of various endangered mussel species each year, if they are able to collect the gravid females of target species. Evaluations of the success of this release program will begin in summer 2001.

David Withers (TN Heritage Program) reported that his work with many partners (Sequatchie & Marion County governments, a local quarry, TDOT, a barge company, a crane company, cement company, and more) to enhance habitat of the endangered royal snail (*Pyrgulopsis ogmorhaphe*) continues in Sequatchie and Jasper, Marion Co., TN. At Sequatchie, this work has included installation of a cable fence to keep ATV's out of Owen Spring in Sequatchie, and replacing the exotic chines privet with native vegetation (or attempting to!). This is also the area where the recently described caddisfly (*Glyphopsyche sequatchie,* Etnier & Hix) is found. At Jasper, the work has included trapping beavers to maintain the spring-run habitat required by the snail.

David also reported surveys for several rare crayfishes. These surveys include surveying new and historic sites for *Cambarus williamsi,* (known only from Brawley's Fork, Cannon Co., TN) in fall 1999. He and April Hannah have also done surveys for a rare, troglobitic crayfish, *Orconectes incomptus*, and have found it still present at one of the historic locales - Haile Cave, Jackson Co., TN. David plans to continue surveys for both of these crayfish in 2000. He is also planning to re-survey the more headwater streams reported on O'bara's 1985 *Orconectes shoupi* survey, Mill Creek drainage, Davidson Co., as these headwater areas in the metropolitan Nashville area are being rapidly developed.

Captive propagation, reintroduction, and other management activities

Pat Rakes and J. R. Shute (Conservation Fisheries, Inc., CFI) report that they still maintain captive populations of: *Cyprinella caerulea; C. monacha; Notropis mekistocholas; N. cahabae; Phoxinus cumberlandensis; (gone)*; *Fundulus julisia; Noturus baileyi; N. miurus; N. flavipinnis; Elassoma alabamae; E. boehlkei; Etheostoma wapiti; E. percnurum; E. luteovinctum*; *Percina copelandi*; and *P. aurolineata.* In addition to those reported last year, recent successful captive spawnings include *Notrops cahabae*, *Noturus miurus*, and *Elassoma boehlkei.*

As previously reported, spotfin chubs, smoky and yellowfin madtoms, and duskytail darters *(C. monacha, N. baileyi, N. flavipinnis*, and *E. percnurum)*, were again captively propagated and reintroduced into Abrams Creek in the Great Smoky Mountains National Park, (Blount County, TN). For the fifth consecutive year, reproduction was documented for *E. percnurum* and *N. baileyi*, and individuals of all four reintroduced populations were observed on most monitoring surveys. Etnier reported that during the Park Service's annual 3-pass depletion study in Abrams last fall they got several individuals of *C. monacha* and two *E. percnurum*; in 1998 they got *C. monacha* and a lone *N. baileyi.*

Pat & J.R. report that the status of *Fundulus julisia,* Barrens topminnow, continues to be tenuous. For two consecutive years, droughts have stressed the population at the type locality (near McMinnville, Coffee Co., TN) to the point that rescue has been necessary. In fall 1999 the type locality pond dried up completely, and Pat & J.R. rescued about 100 Barrens topminnows which are currently in captivity at CFI's hatchery. These will be restocked in the pond when conditions are better.

Dick Biggins (U.S. Fish & Wildlife Service, Asheville, NC) reported that he has written three proposals to reintroduce listed fishes. These include a stretch of the Tellico River (Monroe Co., TN), where he proposes to reintroduce smoky and yellowfin madtoms, spotfin chub, and duskytail darter. The spotfin chub, slender chub, pygmy and yellowfin madtoms, and duskytail darter are proposed for reintroduction into the Douglas Reservoir tailwaters of the French Broad River. And, spotfin chub and boulder darter are proposed for reintroduction into Shoal Creek (Lawrence Co., TN & Lauderdale? Co., AL). Public comments have been received on all these proposals, but none have been finalized yet. The Tellico River proposal is currently being reviewed in the Washington, D. C. office, the French Broad proposal is in review in Atlanta, and the Shoal Creek proposal is being reviewed in the Asheville office of Fish & Wildlife

Service.

Dick also reported that a draft document which outlines a coordinated strategy for the conservation and recovery of southeastern imperiled fishes has been prepared by himself and Vince Mudrak (U.S. Fish & Wildlife Service, Warm Springs, GA). This document was compiled with input from over 60 fish and aquatic ecology experts who attended a workshop in Chattanooga, TN in October 1999. The goal of this document is to identify the problems faced by southeastern imperiled fishes, to summarize the suggestions of the workshop attendees as to specific goals and tasks needed to reverse the declines, and to help agencies, organizations, and individuals identify the types of conservation and recovery tasks that they could implement in order to assist in the momentous task of conserving the Southeast's imperiled fishes. This regional strategy, when finalized will probably be available on the web, and a separate document, for more general consumption, may also be produced.

Peggy W. Shute and David A. Etnier

REGION IV - South-Central

Steve Walsh at the U.S. Geological Survey in Gainesville, Florida reports that he, along with Noel Burkhead, Howard Jelks, and Jim Williams, provided expertise in identifications of fishes collected as part of the Mobile River study unit of the USGS National Water Quality Assessment (NAWQA) program, in coordination with personnel at the Water Resources Division in Montgomery. These samples consisted of a small number of synoptic sites scattered around the Mobile Basin (Tombigbee, Black Warrior, Cahaba, Alabama/Coosa) where quantitative water quality and habitat parameters and fish and invertebrate samples were taken. No new or unexpected records were revealed in the first of this three-year study. Further collaboration with the NAWQA project is anticipated this year as the Mobile River unit was selected as one of three watersheds nationwide for a pilot study to examine the effects of urbanization on water quality parameters (including fish diversity and abundance) across a land-use gradient. This effort will be concentrated in the Valley and Ridge province across a swath that encompasses the greater Birmingham area, and will focus on small-order, wadeable tributaries at approximately 30 stations. Fish collections will be archived at UAIC and FLMNH.

Frank Parauka of the U.S. Fish and Wildlife Service (USFWS) in Panama City, Florida reports that his office has conducted a number of Gulf sturgeon investigations. One hundred and three *Acipenser oxyrinchus desotoi* were collected and tagged (Floy T-Bar and PIT tags) in the Apalachicola River below the Jim Woodruff Lock and Dam. Fish were collected from June through September 1999 using sinking gill nets of various meshes set in random locations below the dam. The fish ranged in total length from 63 to 244 cm and weighed from 1 to 81 kg. The number of sub adults (fish weighing less than 18 kg) was slightly higher than in 1998, and the number of large fish (over 45 kg in weight) was slightly lower. This population was estimated at 321 individuals using a modified Schnabel mark-recapture method. During the same time period, the Brothers River, a tributary to the Apalachicola River, was sampled seven times with sinking gill nets of various mesh sizes. Seventy one Gulf sturgeon ranging in length from 60 to 237 cm and weighing from 2 to 84 kg were collected and tagged during the period. Thirty-two subadult and adult sturgeon collected at the above two sites were equipped with external sonic tags to document migration patterns and habitat use in Apalachicola Bay. Additionally, a total of 450 subadult and adult Gulf sturgeon were collected and tagged during a 17-day gill netting study conducted in the lower Choctawhatchee River in October and November. Subadults represented 46% of the sample while fish weighing over 45 kg accounted for 8.5% of the catch. Based on these data, the population is estimated at 3,000 fish. Lastly, the lower Apalachicola River was stocked with 150,000 Phase II *Morone saxatilis*. This was the third year in a row that the stocking goal of 100,000 had been exceeded. The program is part of a cooperative agreement between the Fish and Wildlife Service and Florida, Georgia and Alabama to restore striped bass in the Apalachicola-Chattahoochee-Flint river system.

Bob Butler of the USFWS in Asheville, North Carolina reports that numerous Federal and State agencies and local partners are collaborating on riparian habitat restoration projects on the Conasauga and Etowah rivers. These two rivers contain endangered (*Percina antesella*, *P. jenkinsi* and *Etheostoma etowahae*) and threatened (*Cyprinella caerulea*, *Etheostoma scotti*) fishes, as well as numerous protected mussels. The Conasauga River Alliance and Upper Etowah River Alliance were formed to address water quality concerns in their respective watersheds. Both projects have two major "drivers" spearheading on-the-ground efforts: the Limestone Valley Resource Conservation and Development Council and The Nature Conservancy (TNC). TNC has hired two full-time representatives to coordinate basin-wide activities in the Conasauga, and will soon hire a field rep to work in the Etowah. Field reps work closely with riparian landowners to effect Best Management Practices, sponsor "field days" to discuss and exhibit environmentally sound farming and forestry practices, and coordinate other restoration and outreach activities with the Alliance. Primary partners in these projects include the USFWS, USDA's Natural Resources Conservation Service and Forest Service, University of Georgia Institute of Ecology, EPA, Georgia Dept. of Natural Resources, Tennessee Wildlife Resources Agency, Southeast Aquatic Research Institute, and several other agencies, organizations, and local citizens and landowners. Federal seed money has been leveraged by these organizations into hundreds of thousands of dollars to protect these globally significant centers of aquatic biodiversity.

Malcolm Pierson at Alabama Power Company completed a status survey of *Etheostoma chuckwachatte* and the undescribed muscadine darter, *Percina* (*Alvordius*) sp. in the upper Tallapoosa River system in Alabama and Georgia. The U.S. Fish and Wildlife Service funded this survey. Lipstick darters were found at 65% of all sample sites and muscadine darters were present at 95% of the sites. Based on earlier collections in the upper Tallapoosa system, it appears that most known populations of both species are stable. Potential threats these species include increased sedimentation to the Tallapoosa main

channel above Harris Reservoir, the scouring of the stream bottom by peaking hydroelectric discharges the dam, and the proposed West Georgia Regional Water Supply Project in Haralson County, Georgia. This proposed reservoir would impound up to 15 miles of the main channel of the Tallapoosa and five miles of lower Beach Creek. Malcolm also reports that Alabama Power Company and the U.S. Geological Survey, Biological Resources Division in Gainesville, Florida will begin a more intensive study of the endangered southern clubshell (*Pleurobema decisum*) in the old bypassed Coosa River channel (known as the Dead River by locals) upstream of the Weiss Hydroelectric Dam. They will attempt to determine the present distribution, density and relative health of this newly rediscovered mussel population in northeastern Alabama.

Scott Mettee reports that biologists with the Geological Survey of Alabama were busy last year. Section 6 status surveys were completed on *Alosa alabamae* in the Choctawhatchee River and *Percina lenticula* and *Crystallaria asprella* in several Mobile Basin rivers. Mussel faunas were surveyed in the Conecuh, Choctawhatchee/Pea, and upper Tombigbee rivers. Efforts to gather data on the biology, population structure, and movements of *Cycleptus meridionalis* in the Alabama, Mobile, and Tombigbee rivers are continuing. Sonic tagging and tracking efforts have yielded some particularly interesting life history data for this species. To date, they have confirmed that individuals move up to 350 miles and cross over or through Claiborne Lock and Dam twice during a single spawning run. This suggests southeastern blue suckers inhabiting the Alabama River may complete one of the longest spawning runs of any freshwater fish species in North America. Of additional interest, many individuals return to the same stretch of river, even the same submerged log, for consecutive summers. Additional sonic tags will be implanted in more *C. meridionalis* and in two or three other species; likely candidates include *Polyodon spathula*, *Moxostoma carinatum*, and *Morone saxatilis*. Several reports have been published or are in progress. Pat O'Neil and Tom Shepard authored a summary report on several years of biological and water-quality work in the Cahaba River system. Stuart McGregor and Jeff Garner of the Alabama Wildlife and Freshwater Fisheries will soon publish a report on mussels in the Tennessee River proper. Lastly, preparation of a publication on Tennessee River fishes in north Alabama and northeast Mississippi is almost complete. The report includes new collection data and localities and expands species distributions given in Fishes of Alabama and the Mobile Basin.

Bob Stiles at Samford University reports that he has just completed a study for the city of Hoover on the upstream distribution of *Notropis cahabae*. He found specimens seven river miles above Piper Bridge, which is upstream of the recent distribution, but far below the historic upstream distribution in 1982 (first shoal below Booths Ford). Bob is also finishing his study on population estimates and habitat use by *Cottus paulus* in Coldwater Spring. Bob reports that he and Paul Blanchard are searching the upper Coosa for a spring that would be appropriate to transplant pygmy sculpins into. They have also finished a study for USFWS on the historic distribution of *Cyprinella caerulea* within the Cahaba River system. This species was abundant throughout the Cahaba above the fall line until the early 1960's, and was completely extirpated after 1983. Lastly, Paul is expanding his study for the USFWS using GIS to analyze habitat structure of *Etheostoma chermocki* and water quality at six sites in the Turkey Creek watershed.

J.R. Shute reports that Conservation Fisheries is currently propagating *Notropis cahabae* and *Percina aurolineata* from stock from the mainstem of the Cahaba River. These fishes are to be used for toxicity studies being conducted by EPA. So far they have produced nearly a thousand Cahaba shiners and around 40 goldline darters. The shiners lay their eggs in a gelatinous mass; this has not been seen this in any other minnow. The larvae are extremely tiny and require a considerable amount of care initially. Excess fish could conceivably be used to augment populations in the Cahaba River. They only had a couple of pairs of goldline darters to start with, and *Percina* in general are very difficult to raise, but they hope to be able to produce good numbers this spring. These techniques will be published at some point in the near future. Additional work includes the possibility of reintroducing *Cyprinella caerulea* into the Cahaba; Conservation Fisheries have propagated blue shiners in the past. Another possible reintroduction of *Etheostoma wapiti* and *Erimonax monacha* into Shoal Creek in northern Alabama is in the works. Both species have been propagated and could be produced in large numbers.

Mark Peterson at the Gulf Coast Research Lab in Ocean Springs, Mississippi was elected as the secretary/treasurer of the Southeastern Division of ASIH and president-elect of the Gulf Estuarine Research Society. Mark has co-authored three marine papers this last year on sampling marsh nekton, ontogenetic standardization of estuarine fishes, and spatio-temporal distribution of larval *Gobiosoma bosc* adjacent to natural and altered marsh-edge habitats. He has also two papers on *Cycleptus meridionalis,* including its growth, spawning preparedness and diet as well as the its catch-per-unit-effort, environmental conditions and spawning migration.

Stuart Poss, also at the Gulf Coast Research Lab, has authored a paper on how coastal fish distribution and diversity in the southeastern United States is changing. He has also co-authored guidelines for the application of IUCN Red List criteria at national and regional levels. Stuart continues to make progress on the website dealing with non-indigenous species in the Gulf of Mexico ecosystem and associated coastal area. A new web server was installed to expedite the delivery of this information:
http://lionfish.ims.usm.edu/~musweb/invaders.html.
He is looking for input and collaborators to extend information available on non-indigenous species in the region. The web server also hosts the website for the XVIIIth International Congress of Zoology:
http://lionfish.ims.usm.edu/~musweb/icz_xviii/icz_home.html.
Lastly, Stuart reports that about 3,000 lots have been added to the GCRL Collection and the museum is in its second year of grant support from the National Science Foundation.

Todd Slack of the Mississippi Museum of Natural Science in Jackson reports that the museum is scheduled to open its new facilities to the public in March 2000. Most of the work on the exhibits, dioramas, aquaria and outdoor landscape has been completed, and most of the collections have been unpacked.

However, the majority of the Ichthyology Collection is still boxed up and virtually inaccessible. The process of unpacking is slow as Todd is taking the opportunity to inventory all catalogued lots and conduct routine curatorial maintenance. The Museum staff continues to grow. Roy Weitzell joined the Museum last year as a Fish Biologist. Roy received his master's degree from Southern Illinois University for his taxonomic revision on a genus of South American thorny catfish, *Acanthodoras*. While at SIU, Roy also worked on status and life history aspects of *Lampetra aepyptera* in Illinois. Scott Peyton recently joined the Museum staff as the Collections Manager. Scott received his master's degree at the University of Southern Mississippi for his work on habitat partitioning between *Etheostoma lynceum* and *E. histrio* in the Bayou Pierre system. Scott has spent the last several years at Auburn working with the Alabama Cooperative Fish and Wildlife Research Unit.

Jan Hoover at the Corps of Engineers Waterways Experiment Station (WES) in Vicksburg, Mississippi reports that he, along with fellow staff members Jack Killgore, Steven George, and Bradley Lewis are continuing to sample a gravel bar constructed in 1988 in a cuttoff of the Tenn-Tom waterway. Neil Douglas (Professor Emeritus at University of Louisiana at Monroe) is also involved in this project. The gravel bar is maintained by flow diverted from the locking operation. One specimen of *Crystallaria asprella* was collected in 1989, indicating that the constructed bar could provide habitat for this rare species. To date 17 crystal darters have been collected. Another flow restoration project is underway in a cutoff of the upper Little Tallahatchie River (Yazoo River). The cutoff was a flood control measure in the 1930's and 1940's. Restoration of the now-degraded channel by re-diverting water into it is being considered. Data on fish communities and physical habitat were collected in 1998, and empirical fish-habitat models were developed last year. These were used in conjunction with hydraulic simulations to estimate restoration benefits to lotic minnow assemblages. The WES crew is also sampling fishes and physical habitat at very low flows in the upper reaches of the Big Sunflower River in autumn and early winter. Augmentation of flow via groundwater pumping is planned for the near future and these data will be used to develop empirical fish-habitat models to estimate any benefits produced. One other project in the Yazoo River Basin is the evaluation of the effects of dredging and snagging on littoral and demersal fishes. The principal streams are the Tallahatchie, Yalobusha, and Yazoo rivers. Baseline (pre- project) data were collected in 1989-1990, by electrofishing and hoopnets. These data will be compared with post-project data collected in 1999-2000 at identical sites using identical methodology. Jack, Jan, Dr. Douglas, and William Lancaster (a commercial fisherman) are involved in this years efforts. Lastly, two *Ictiobus bubalus* and two *I. cyprinellus* recently collected from the Big Sunflower River had severe deformations of the face and mouth. These fish were x-rayed this year for skeletal description to determine if deformations are developmental or traumatic in origin.

Melvin Warren of the USDA Forest Service, Southern Research Station, Oxford, Mississippi is pleased to announce the addition of a new stream ecologist to his staff. Susie Adams, who received her doctorate from the University of Montana in 1999, joined the staff in February. Susie brings expertise in fish population dynamics, fish movement, fish-habitat interrelationships, and species interactions. She has already joined Mel and Wendell Haag in wading through fish and fish habitat data compiled from over 70 sites in the Little Tallahatchie, Tippah, Yocona, upper Wolf, and upper Hatchie river systems. That survey was conducted last summer and yielded interesting finds, given the degraded condition of many of these systems (e.g., *Percina shumardi*, *Hybognathus hayi*, *Erimyzon sucetta*, *Noturus hildebrandi*). Wendell and Mel have also been surveying the mussel fauna in the Sardis Reservoir tailwater (Little Tallahatchie River drainage), Sipsey River, and Buttahatchie River. The mussel community in each of these systems is dense, and most species show strong patterns of recruitment. The Sipsey River mussel fauna is doing extraordinarily well, and it is perhaps the only river in the Southeast in which federally listed species are among the dominant members of the community (e.g., southern clubshell, *Pleurobema decisum*). The study is aimed at describing population dynamics by estimating annual recruitment, mortality, and age and length specific fecundity. Mel also reports that the Technical Advisory Committee of SFC submitted the southern fishes distribution and conservation status paper to Fisheries, where it is undergoing peer-review.

Hank Bart at Tulane University reports that he, along with graduate students Kyle Piller, Jason Tipton, Nakia Jackson, and interns from the New Orleans Science and Math High School, conducted surveys in Bowie River and Okatoma Creek in 1999 looking for *Percina aurora*. The surveys failed to turn up specimens. Hank is presently surveying the Chickasawhay River. Steve Ross collected the species at the confluence of the Bowie and Leaf rivers in 1999, and Todd Slack collected young in the Pascagoula River. Hank and Kyle Piller surveyed sites on the Blackburn Fork of the Little Warrior River and the Cahaba in 1999 looking for the *Percina brevicauda*. The number of specimens taken in both systems was very small. Tom Shepard of the Alabama Geological Survey reported higher numbers of specimens collected in about 60 river miles of the Locust Fork of the Black Warrior River between 1997 and 1998. Tom reported limited success collecting the species in number in the Cahaba River from 1992 to 1996. The last time the species was collected in the Coosa River system (Hatchet Creek) was by Malcolm Pierson in 1995. Malcolm failed to collect the species on a return visit to Hatchet Creek in 1999, and Hank, Carol Johnston, Jon Armbruster, Kyle Piller and a large party of graduate students from Auburn failed to collect the species on a visit in 2000. Hank is of the opinion that federal protective status is warranted for this species. Now that the rush darter (*Etheostoma phytophilum*) is described, Hank is planning field work to assess the status of known populations of this species. Sporadic checks of the type locality in Pinson, AL have failed to turn up specimens since 1994. Localities in the Clear Creek system have not been surveyed since 1993. Hank is also recommending federal protective status for the rush darter. Lastly, Kyle Piller and Jason Tipton conducted a status survey *Noturus munitus* in the Pearl River. They collected the species in low numbers at five sites. Abundance of the species in the Pearl River has declined considerably in the last two decades, and Kyle and Jason believe this is related to geomorphic instability in the river.

Matt Thomas at Eastern Kentucky University in Richmond has been successful in diagnosing differences between *Noturus stigmosus* and *N. eleutherus* in the Ohio River drainage, where both species can be associated and are often difficult to separate using available keys. He is also examining morphological variation throughout the range of the *N. stigmosus*. Preliminary data analysis indicates that populations in Coastal Plain streams of western Tennessee and Mississippi are distinct in body shape and pigmentation, when compared to populations in the Ohio River and western Lake Erie drainages. An assessment of the taxonomic status of *N. stigmosus* is currently underway.

Rick Mayden at the University of Alabama, along with Dave Neely, finished a survey for *Etheostoma trisella* in the upper Coosa in Alabama. No specimens were found. Dave continues his work on sculpins and plans to have two species descriptions out this year; the Tallapoosa sculpin with Rick and Jim Williams, and *Noturus* sp. cf. *munitus* with Rick and Phil Harris. Rick and Bernie Kuhajda are finishing a survey of *Etheostoma ditrema* from throughout its range in Alabama, Georgia, and Tennessee. Results from another survey, the blueface darter, *Etheostoma* sp. cf. *zonistium*, indicate that the Bear Creek population is shrinking and the stronghold for this species is the population in the upper Sipsey Fork. A more detailed study of this healthier population in the Bankhead National Forest will commence this year.

Scaphirhynchus suttkusi, the Alabama sturgeon, is again in the news. It was proposed for listing for a second time in March 1999. Due to political pressures, the final ruling was postponed until March 2000. The public comment period has been reopened numerous times for various reasons, including the release of a genetics study on sturgeon caviar and a conservation agreement and strategy between the USFWS, the Corps of Engineers, the State of Alabama, and a business coalition. Specimens continue to be captured in the lower Alabama River. In April 1999 a recreational fisherman captured a sturgeon below Claiborne Lock and Dam, which was transported to the Marion Fish Hatchery. In July 1999 a commercial fisherman gillnetted another sturgeon in the Claiborne Pool. It was released and recaptured 19 days later by Alabama Dept. of Conservation and Natural Resources personnel, transported to the hatchery, and died three days later. Spawning of Alabama sturgeon was attempted at the in March 1999. A male and female sturgeon held in the hatchery since 1997 were induced to spawn. The female produced 4,000 eggs but the male did not produce sperm. Unfortunately, the female died in April 1999. All of the data to date overwhelmingly supports the listing of *Scaphirhynchus suttkusi* as federally endangered.

Bernie Kuhajda

REGION V - Northwest

Arkansas

The White River Navigation Project was reauthorized by the Water Resources Development Act of 1996 and proposes to construct and maintain a 125-foot wide by nine-foot deep navigation channel from the mouth upstream to Batesville, AR (approximately 255 river miles). A notice of intent to prepare a Supplemental Environmental Impact Statement was published by the Corps of Engineers in the Federal Register (Volume 64, No. 5, p. 1181) on January 8, 1999. Corps Waterways Experiment Station personnel spent several weeks in the field in late 1998 gathering data to assess the possible impacts of the navigation project on littoral and demersal fishes, including paddlefish and sturgeon. Several public and agency meetings regarding the project were held during 1999. WES personnel (Jan Hoover, Jack Killgore) presented preliminary findings of the fish studies to regulatory agencies in October 1999 and a HEP team meeting was held in St. Louis in January 2000. Several irrigation projects have surfaced which will be competing for White River water use. The Grand Prairie Irrigation Project is planned to alleviate pressure on east Arkansas aquifers, which have been severely depleted during the past decade of withdrawals for irrigation. The proposed Grand Prairie Irrigation project will pump water from the White River into a series of canals, natural streams, and holding ponds. Several hundred miles of new canals are planned to distribute water to holding ponds within the Grand Prairie region. Two other similar projects are in the planning stages, and both are also in the White River Basin. The Fish and Wildlife Service and Environmental Protection Agency have called for a "unified assessment" of these development projects to determine potential impacts to the stream biota of the White River basin. A Draft Supplemental EIS for the navigation project was originally scheduled for distribution in early spring 2000. The demand for the unified assessment has delayed the completion of the navigation project Supplemental EIS.

U.S. Army Corps of Engineers Waterways Experiment Station personnel are evaluating the feasibility of diverting water from the Arkansas River near Little Rock into the Bayou Meto drainage for agricultural irrigation, commercial withdrawal, and duck management. WES personnel are determining potential losses of larval fishes from the Arkansas River during water diversion and estimating fish benefits of increased water level in receiving streams and canals.

Henry Robison (Southern Arkansas University) is working on the distribution and life history of *Notropis ortenburgeri* in the Ouachita National Forest. Also, Henry has been working with the Ouachita National Forest, Arkansas Game and Fish Commission, and Arkansas Natural Heritage Commission to digitize and geo-reference all major fish collections in the state.

Charles Gagen (Arkansas Tech University) has been studying fish movements at Forest Road stream crossings on six Ouachita River drainage streams in the Ouachita National Forest. Downstream species numbers averaged 12.3 for the six streams and upstream species numbers averaged 6.3. Three of the crossings have been modified in an attempt to improve fish passage, and the study continues for the next year.

Missouri

Dan Beckman (Southwest Missouri State) has been working on age/growth studies for *Noturus exilis* and *N. albater* in Bull Creek, (White River drainage), MO. They have also been comparing different techniques for aging the madtoms.

Matt Winston (Missouri Dept. Conservation) reports they

are continuing their statewide, baseline data surveys with concentration during the past year in the Missouri bootheel. As a result of these surveys, *Fundulus chrysotus*, has been rediscovered in two channelized streams. Also, *Cyrstallaria asprella* was collected at several sites in the Black River. Matt also reports that *Notropis topeka* apparently has disappeared from one of three creeks that it was known from in Missouri.

John L. Harris

REGION VI - Southwest

The following summary of activities of the 'fish team' at the U.S. Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS was submitted by Jan Hoover. The WES Fish Team consists of seven individuals. Jack Killgore (KJK), Jan Hoover (JJH), Phil Kirk (JPK), Steven George (SGG), and Bradley Lewis (BRL) are full-time employees at Waterways Experiment Station. Neil Douglas (NHD) is Professor Emeritus at University of Louisiana at Monroe (formerly Northeast Louisiana University). William Lancaster (WEL) is a self-employed commercial fisherman.

Ongoing projects are listed by system or drainage. Personnel associated with each project are indicated parenthetically. Principal investigator of each project is listed first.

Ouachita River Drainage

Floodplain ponds as paddlefish habitat (SGG): Fishes and habitat data collected several years ago from floodplain ponds of the Ouachita River (Louisiana) were analyzed last year. Assemblages and habitat characteristic of ponds with and without paddlefish are being described.

Sulphur River Basin

Preservation of Mercer Bayou (KJK, JJH, NHD, WEL): Mercer Bayou (Arkansas), a tributary of the Sulphur River, is threatened by lateral headcutting from the Sulphur River. Weirs are being considered to prevent the erosion and de-watering of Mercer Bayou. Fishes and invertebrates were sampled in summer 1999. Species richness of fishes, abundance of zooplankton, and abundance of scuds and glass shrimp were all positively associated with stream width, indicating substantial impacts to aquatic communities if headcutting is not stopped.

Red River Drainage

Oxbow Lakes of the Red River (KJK, SGG, BRL, NHD, WEL): During construction of the Red River Waterway, numerous bendways were cut off from the main channel creating a series of oxbow lakes along the river corridor. Upstream closures were constructed in 24 lakes to prevent sedimentation. However, backwater entering the downstream end of the lakes has resulted in sedimentation at the outlet, and some lakes are becoming isolated from the river. We are evaluating the benefits of periodically dredging the access channel of the downstream end of oxbow lakes by comparing fish assemblages among lakes with different geomorphometry and hydrologic connection to the Red River.

Red River Navigation Project (JJH, KJK, SGG, BRL, NHD, WEL): Feasibility of extending the Red River Waterway Navigation Project an additional 84-134 miles is being considered by the Corps of Engineers. Our team is studying fish communities throughout the proposed project area to determine effects to littoral, demersal, and pelagic fish communities.

Hydrology and Spawning (KJK, BRL): Cypress Bayou (Texas), a tributary of the Red River, is small river dominated by bottomland hardwood wetlands. Flows are controlled by releases from Lake o' the Pines. Effect of adjusting the timing and duration of reservoir releases were evaluated by surveying controlling elevations of backwaters (to determine extent of spawning habitat) and by surveys of larval fishes during three spawning seasons. Each spawning season was characterized by a distinctive hydrography. Reservoir releases may be manipulated to control changes in flood pulse that benefit spawning fishes.

Dr. Neil Douglas, Professor Emeritus, The University of Louisiana at Monroe, was named the W. Frank Blair Eminent Naturalist by the Southwestern Association of Naturalists. The award recognizes "excellence in a lifetime of commitment to outstanding study or conservation of the flora or fauna of the Southwest." Neil accepted the award at the 2000 SWAN meeting in Denton, Texas, April 20-22.

Frank Pezold

Southeastern Fishes Council Proceedings

Information For Contributors

The primary purpose of the *Proceedings* is to publish peer-reviewed research papers and critical reviews of activities; regional reports and notes; and other pertinent information pertaining to the biology and conservation of southeastern fishes. The *Proceedings* is also an outlet for range extensions, distributions, and status papers, covering ecology and conservation ichthyology. Life history studies, faunal surveys, management issues, behavior, genetics and taxonomy of southeastern fishes are appropriate topics for papers in the *Proceedings*. Review papers or information on imperiled waters or fishes are particularly appropriate.

Manuscripts should be submitted in duplicate. A good guide for manuscript preparation is the Sixth Edition of the *CBE Style Manual* available form the Council of Biology Editors, One Illinois Center, Suite 200, 111 East Wacker Drive, Chicago, IL 60601-4298.

The entire manuscript including the Abstract (required for longer articles), Introduction, Methods, Results, Discussion, Acknowledgments, Literature Cited, Appendices, Tables, and Figure Legends must be double-spaced. The title, author's name and author's address (including fax number and email address for corresponding author) should be centered on the first page. Indicate a suggested running head of less than ten words at the bottom of the first page. An Abstract (if necessary) will be placed at the beginning of the text. Acknowledgments will be cited in the text immediately before the Literature Cited. All references cited in the paper will follow the standard format of using the last name of the author(s) followed by the year of publication of the paper. In the Literature Cited, the references will be alphabetical by the author's last name and chronological under a single authorship. Literature cited should be standardized and abbreviated, using the *World List of Aquatic Sciences And Fisheries Serial Titles* or guidelines in *CBE Manual for Authors, Editors, and Publishers 6th ed.* for journals not included in the *World List*.

Tables should be typed on a separate page, consecutively numbered and should have a short descriptive heading. Figures (to include maps, graphs, charts, drawings and photographs) should be consecutively numbered and if grouped as one figure each part block lettered in the lower left corner. Computer-generated graphics should be high quality prints; for drawings, high quality prints or photocopies are preferred to the original line art. Legends for figures must be on a separate sheet and each figure must be identified on the back. The desired location of each table or figure should be indicated in the margin of the manuscript. When possible, tables and figures will be reduced to one column width (3.5 in), so lettering on figures should be of appropriate size. Color figures can be printed at the author's expense.

Manuscripts will be subject to editing and will be reviewed by at least two anonymous persons knowledgeable in the subject matter. The edited manuscript and page proofs will be furnished to the author. Upon returning the reviewed and corrected manuscript to the editor, a PC disk copy of the final form of the text, tables and computer-generated graphics is also requested. Specific formatting information for the disk will be sent to the author with the edited manuscript. Reprints can be ordered at the time of printing, and will be supplied to the author at the cost of printing.

Regional reports, news notes and other short communications will also be edited and included when possible in the next number.

Only manuscripts from members of The Southeastern Fishes Council will be considered for publication. There is no charge for publishing in the *Proceedings*. All manuscripts and short communications should be sent to the editor:

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http://www.flmnh.ufl.edu/fish/organizations/sfc/SFCDefault.htm

Proceedings is a publication of the Southeastern Fishes Council, Inc, and is published in Charleston, South Carolina. Officers are Stephen T. Ross, Chair; Mary Freeman, Chair-Elect; Gerald Dinkins, Secretary; and Peggy Shute, Treasurer. Editor for the *Proceedings* is Frank Pezold, Museum of Natural History (Zoology), College of Pure and Applied Sciences, The University of Louisiana at Monroe, Monroe LA 71209, (318) 342-1750, bipezold@ulm.edu; Associate Editor is George R. Sedberry, Marine Resources Research Institute, P.O. Box 12559, Charleston, SC 29422-2559, (843)762-5045, sedberryg@mrd.dnr.state.sc.us. *Proceedings* is printed on recycled paper.